THE

WORLD'S

CAN DA

COLUMBIAN EXPOSITION

CHICAGO

CATALOGUE OF 1893.

MINERALOGICAL EXHIBITS

CROWN LANDS DEPARTMENT,

ONTARIO. CANADA.

PUBLISHED UNDER AUTHORITY OF
N. AWREY, ESQ M.P.P COMMISSIONER FOR ONTARIO

By DAVID BOYLE.
SUP'T. OF MINERALOGICAL EXHIBITS FOR THE PROVINCE OF ONTARIO.

WORLD'S

COLUMBIAN EXPOSITION.

[CHICAGO, ILL., MAY 1 to OCTOBER 30, 1893.]

MINERAL EXHIBIT

OF THE

PROVINCE OF ONTARIO.

DESCRIPTIVE CATALOGUE.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT ST. WEST.
1893.

GOVERNMENT OF ONTARIO.

Premier and Attorney-General :
SIR OLIVER MOWAT, K.C.M.G.

Commissioner of Crown Lands :
HON. ARTHUR S. HARDY.

Commissioner of Public Works :
HON. CHRISTOPHER F. FRASER.

Provincial Secretary :
HON. J. M. GIBSON.

Provincial Treasurer :
HON. RICHARD HARCOURT.

Minister of Education :
HON. G. W. ROSS, L.L.D.

Minister of Agriculture :
HON. JOHN DRYDEN.

Without Portfolio :
HON. E. H. BRONSON.

COMMISSIONER FOR ONTARIO.

N. AWREY, M.P.P.

SUPERINTENDENT OF MINERAL EXHIBIT

DAVID BOYLE.

CONTENTS.

	Page.
Introductory	4
Ontario (Descriptive)	5
Royal Commission on Mineral Resources of the Province	6
Iron	8
Copper	13
Nickel	16
Zinc	21
Antimony	22
Galena	22
Silver	23
Gold	26
Platinum	30
Crystallography	31
Building, Monumental and Ornamental Stones	37
Granite, Gneiss, etc	37
Jasper	39
Sandstone and Freestone	39
Serpentine	40
Limestone (Building)	40
Limestone (Marble)	41
Lithographic Stone	45
Clay and Marl	45
Soapstone	46
Graphite	47
Molybdenite	48
Actinolite	49
Asbestos	49
Mica	50
Feldspar	51
Quicklime	51
Hydraulic Cement	51
Gypsum	52
Salt	52
Barite	54
Celestite	54
Pyrites	54
Mineral Paints	55
Phosphate of Lime	55
Petroleum	58
Lignite	61
Natural Gas	61
Oil Shale	61
Mineral Water	61
Arsenic	61
Miscellaneous	62
Thunder Bay Collection	62
Maps	64
Photographs	64

INTRODUCTORY.

This catalogue of mineral specimens exhibited by the Government of the Province of Ontario, although to some extent defective, contains, nevertheless, references to a larger variety of material and to a greater number of localities than have hitherto been represented in any collection illustrative of Ontario's mineral wealth.

The object kept constantly in view was rather to make a good general, average display, than to bring together a quantity of unusually rich specimens. The latter would no doubt attract more popular attention, but it is to an exhibit of the former description that the hard-headed, practical, mining expert turns when he contemplates making an investment.

In as many instances as possible, the full names and addresses of exhibitors have been given, to facilitate correspondence between interested parties. In like manner, the lots, concessions, (ranges) townships and counties are supplied for ease of reference to maps, especially by inquirers not "native, and to the manner born."

A considerable number of the specimens under glass illustrate the crystallography of the Province. Some are of rare occurrence and a few are of obscure character. In most cases of difficult identification, Professor A. P. Coleman of the Ontario School of Practical Science was referred to, and his heartily bestowed, gratuitous assistance has added largely to the value of our exhibit. The arrangement of the catalogue is in accordance with the classification of the Columbian Exposition authorities.

Thanks are hereby tendered to the many owners of mineral properties, who, frequently at the expenditure of considerable time and trouble, exerted themselves to supply specimens for exhibition. Especially are we indebted to Messrs. J. L. Aunger of Blairton; W. G. Kidd, of Kingston, Wiley & Co., Port Arthur; R. H. Ahn of Sudbury, and Mrs. S. G. Fogg, Rat Portage, for valuable typical cabinet specimens, from their private collections.

Thanks are also due to the Canadian Pacific Railway authorities for courtesies extended in connection with bringing the material together.*

*We had hoped with considerable confidence to receive much valuable assistance from the Geological Survey of Canada, having its headquarters at Ottawa. Several applications were made to A. R. C. Selwyn, LL.D., C.M.G., F.R.S. etc., Director and Deputy Minister—lists were prepared by his request stating both what we had collected and what we required, but we have to regret that notwithstanding repeated promises to supply material we received not a single specimen, with the exception of a magnetic iron sample from the Atik-Okan range, for which we have to thank Mr. A. L. Russell, C.E., Port Arthur, who sent it to Ottawa on the understanding that if required for exhibition purposes, Ontario should be permitted to use it.

Toronto, April 15th, 1893.

ONTARIO.

The Province of Ontario (formerly known as Canada West, or Upper Canada) is upwards of one thousand miles in length from the counties of Prescott, on the Ottawa, and Glengarry on the St. Lawrence, to the western limit of Rainy River District, where the boundary is conterminous with that of Manitoba. From the mouth of Albany River on James Bay, in the north, to Pelee Island in Lake Erie at the south, is almost seven hundred and fifty miles.

Its configuration is extremely irregular. On the west and south its outline corresponds mainly with the Canadian shores of the great lakes and the River St. Lawrence. On the north its boundary consists of a series of small lakes, and some considerable rivers extending from the River Winnipeg to James Bay, on which the Province possesses a coast line of about two hundred and fifty miles from the mouth of the Albany River to a point eastwards. From this point the eastern boundary extends in a straight line southerly until it strikes Lake Temiscmaing, near the head waters of the Ottawa, after which, this river, until near its junction with the St. Lawrence, separates the Province from Quebec.

The older and more densely populated portion of the Province may be described as being in shape a roughly triangular peninsula.

The total area of the Province has been computed at fully 220,000 square miles. This is exclusive of the Georgian Bay, and the Province's share of the great lakes, but comprehends hundreds of thousands of small lakes, varying from a few square miles in extent, to three or four hundred, as in Lake Simcoe and Nipissing, and to upwards of two thousand as in Lake Nepigon.

Yet in the hands of the Government, and held as "Crown Lands" open for purchase and settlement, are 180,000 square miles of territory. Most of this lies north and west of Lakes Huron and Superior, but a large proportion of it is unfit for agricultural purposes. Unlike nonarable lands, however, in many other parts of the world, vast areas of these in Ontario are valuable on account of their timber, or their minerals, or both.

Geologically, the systems represented in Ontario are the Laurentian, Huronian, Silurian, Devonian, and the Post-tertiary. Most of the economic minerals occur in the Laurentian and Huronian, and besides the precious ores, include iron, copper, nickel, lead, zinc, platinum, graphite, sulphur, arsenic, gypsum, apatite, mica, talc, and others of more or less economic value. Most of these are referred to in detail in what follows.

The higher formations yield in abundance excellent qualities of building stone, gypsum, petroleum and salt. Limestone is plentiful and few portions of the Province are very distant from beds of it. In many places the finer qualities of crystalline limestone merge into marbles, white, pink, grey and black, some of which are well fitted for monumental and decorative purposes, but few quarries have yet been worked sufficiently to ascertain whether the quality improves as greater depths are reached.

Good granite for monumental purposes is worked near Kingston, and the Canadian Granite Company of Ottawa, turns out annually a large quantity of finished material from the Kingston quarries.

Clay, suitable for brick-making, is pretty evenly distributed throughout the Province, and within the last four or five years, extensive deposits of this material, excellently adapted to the manufacture of pressed brick and ornamental terra-cotta, have been opened up, and are now energetically worked at several places within a comparatively short distance of Toronto. Vitrified and tinted bricks are produced at the works in immense quantities, the capacity of individual establishments varying from 10,000,000 to 15,000,000 annually,

The principal seats of this industry are at, or near, Toronto, Milton and Campbellville, the two latter in the county of Halton.

At various points in the Grand River valley, above Paris, to within fourteen miles of Lake Erie, gypsum beds have been profitably worked for many years, in what is known as the Onondaga formation.

Paris, Mount Healy, York, Cayuga and Caledonia are places where gypsum is produced. There is little doubt that large deposits will yet be discovered in the townships of Tuscarora, Onondaga, Oneida, Seneca and Cayuga, as well as in other townships extending from the Grand River to the Niagara.

In northern Ontario there are large beds known to exist in the valleys of the Moose and Abittibi Rivers, of which not a little is found in the form of selenite. "On Moose River, banks of gypsum occur from ten to twenty feet high, especially on the north-west side below the junction of the Missinaibi, for a space of about seven miles or from thirty-one to thirty-eight miles above Moose Factory. About ten feet of the lower part of the deposit consists of solid gypsum of a light bluish color, but the upper portions are mixed with marl. In some sections of these banks, a comparatively small proportion of the gypsum, but still large commercially speaking, is nearly white, and from this circumstance they have received the name of the 'white banks'."*

Most of the land best adapted to agricultural purposes is in that portion of the Province which is drained by the St. Lawrence, but large stretches are also to be found in the Rainy River District, and in the valleys of many rivers in the other districts.

The mineral areas are chiefly in eastern Ontario, and in the Districts of Nipissing, Algoma, Thunder Bay and Rainy River. In the counties of Victoria, Haliburton, Peterborough, Hastings, Addington, Frontenac, Leeds, Lanark and Renfrew, are iron, copper, lead, apatite, mica and marble in abundance.

Copper and nickel have been discovered in vast quantities in the districts of Nipissing and Algoma, while Thunder Bay and Rainy River Districts have been shown to be rich in silver, gold, iron, lead and zinc.

Salt beds, occupying extensive areas, exist in the counties of Bruce, Huron and Lambton, adjoining Lake Huron, and in the County of Essex.

Petroleum has been found at Comber in Essex County, Bothwell in Kent, Humberstone in Welland, and in Manitoulin Island, but it has been longest, most extensively and most profi ably worked in the County of Lambton, where the two chief centres are Petrolea and Oil Springs.

In the vicinity of Port Colborne in Welland County are many natural gas wells, the gas from which is conducted through sub-lake tubes to the city of Buffalo. Gas wells have also been bored successfully at Kingsville in the County of Essex. In Manitoulin Island and elsewhere there are evidences of the existence of natural gas, and during the year 1892, a fairly good flow was struck at Mimico, within a few miles of Toronto.

Mining operations in Ontario are likely to become more and more active as time advances. Discoveries of new mineral locations are being made frequently, and there is little doubt that in the near future the Province of Ontario will become as celebrated for its mineral resources as it has long been for its agricultural productiveness.

Accompanying Ontario's mineral exhibit will be found a series of maps of the various parts of the Province known to be mineral-producing.

The large, hand-made, geological map of Ontario will be found especially useful as a means of reference, exhibiting as it does not only the trend and comparative areas of the different formations, but the localities, so far as known of the minerals on exhibition.

In 1888 the Government of Ontario appointed a Commission to enquire into and report upon the mineral resources of the Province and on measures for their development.

"Sessions of the Commission for hearing evidence were held at thirty-seven places in the Province, from Ottawa in the east to Rat Portage in the west, and one hundred and sixty-four witnesses were examined under oath, comprising among their numbers explorers, prospectors, miners, mine and quarry owners, mine captains and superintendents, mine brokers, mining engineers, civil engineers, land surveyors, geologists, chemists, mettalurgists, scientists, iron-founders, brick-makers, tile, terra-cotta and pipe manufacturers, iron makers, copper and nickel smelters, mechanics, lawyers, bankers, capitalists and speculators. Mines, mining locations and works in the vicinity of places where the Commission met were examined, and careful enquiry respecting them was made.

"The evidence that Ontario possesses great mineral wealth is abundant, and is constantly accumulating. In the central and eastern counties are magnetic and hematitic iron ores, gold, galena, plumbago, arsenic, mica, fibrous serpentine, apatite, granite, marble and freestone. In the Sudbury District (of Nipissing) copper and nickel mines are being worked on a large scale. In the township of Denison rich specimens of gold-bearing quartz and extensive deposits of copper and nickel are found. Along the north shore of Lake Huron, from the mouth of the French River to Sault Ste. Marie, gold and silver bearing veins, iron, copper, galena, and immense quarries of marble have been discovered. North of the height of land and extending towards James Bay, prospectors report a promising mineral region. North of Lake Superior locations

*Royal Commission Report on Mineral Resources of Ontario, 1890, page 45.

of gold, silver, copper, iron, galena, plumbago and zinc ores have been taken up, besides which there are inexhaustible supplies of granite, marble, serpentine and sandstone. West of Fort William is a silver district, which, judging from the explorations already made, promises to be an argentiferous region of great richness. Beyond this district, and to the north-west are found veins of gold-bearing quartz, and extensive ranges of magnetic iron, while to the south-west is believed to be a continuation of the Vermilion range of northern Minnesota. The partial examination already made, inspires the hope that these will in time be developed as an iron region of great value. Upon Sultana Island and other islands in the Lake-of-the-Woods and in the region adjacent to the lake, gold-bearing veins of good promise have been discovered, and . . . . an early development of some of the properties may be looked for. But knowledge of the extent of our resources is necessarily imperfect. The area of the Province is vast, many districts have not been prospected at all, and, therefore, it may be reasonably presumed that only an inconsiderable portion of our mineral wealth is yet known to us. . . . . .

"The most promising mineral works in the Province, at present, are the mining and smelting of copper and nickel ores in the vicinity of Sudbury. The Canadian Copper Company began operations there in the latter part of 1886, and shafts were sunk on three separate locations, one of which had reached a depth of over 700 feet at the close of 1892. . . . . During 1889 mining operations were commenced by the Dominion Mineral Company of Montreal, and Vivian & Company of Swansea, Wales, the latter being the owners of the largest smelting and refining works in the world. . . . . "

Experiments recently carried on in Europe and America with alloys of nickel and steel, cause great interest to be attached to Ontario's deposits of niccoliferous ores. If the claims made for the alloys are fully borne out by practical application in the metallic arts, the importance of the inventions to this Province can hardly be over-estimated. The ranges discovered in the region north of the Georgian Bay are more extensive than any which have been found elsewhere, and only a small portion of the formation carrying nickel and copper ores has yet been explored.

Quoting from the same report, p. 205, "The mineral deposits of the Province of Ontario are widely spread, varied in character, and cover almost the entire list of economic minerals with the exception of coal and tin. The counties of Leeds, Lanark, Renfrew, Frontenac, Addington Hastings, Peterborough the districts of Nipissing, Algoma East and other portions of eastern and central Ontario, contain numerous deposits of magnetic and hematite iron ores, and the discoveries now made over a wide area of country would seem to warrant the belief that as development proceeds the iron mines of this region will be found to be of great extent and value. It also appears that this region is rich in phosphates, gold, silver, copper, lead, plumbago, nickel, arsenic, mica and asbestos ; granite, marble and freestone in great variety and of excellent quality ; apatite, barite and lithographic stone ; while even rubies, saphires and emeralds have been found. In the Sudbury region enormous deposits of copper and nickel ore have been discovered, and mines on an extensive scale are being developed. In the township of Denison, between Sudbury and Lake Huron, rich specimens of gold-bearing quartz have been taken from the Vermilion and other mining locations, and promising deposits of copper and nickel have been discovered. On the north shore of Lake Huron, from Killarney to Sault Ste. Marie, and convenient to navigation, are found iron, copper, lead and immense quarries of marble. Northward of the Sudbury district prospectors report a mineral region of great extent and prospective value, but which can be developed only through the construction of a railway. The entire region north and west of Lake Superior abounds in minerals and valuable quarries. Gold, silver, copper, iron, lead, nickel, plumbago and zinc are found ; agates and amethysts are abundant ; while valuable building stone of different kinds is spread over a large area. On Black Bay is an immense quantity of granite of finer grain than the Aberdeen ; a red sandstone is found in great bodies at Nepigon Bay, and a white sandstone at the head of Thunder Bay, which is of the finest quality. Brown sandstone of excellent quality is found in abundance, also soapstone, serpentine and marble of different colors. The silver district, extending southwest from Port Arthur and Fort William to the east end of Arrow Lake promises to be an argentiferous region of great richness. Mines have been opened over a breadth of country extending twenty miles from north-east to south-west, and the range stretches some distance beyond the present limit of development. It seems certain that an iron region of large area exists, embracing Hunter's Island and the adjacent region. It is not improbable that this will prove to be one of the richest and most valuable iron-producing districts within the Province of Ontario. On the various islands in the Lake-of-the-Woods, and over an unknown extent of country around that lake, gold-bearing veins are numerous, and seem to indicate from the results of assays of specimens and from the information obtained by partial exploration, that this will become, when its mines are developed, one of the productive gold regions of America."*

*Report of Mining Commission, pp. 21, 22 and 23, 1890.

Tolerably rich platinum has recently been discovered in the Township of Balfour, Algoma.

The following table shows in a general way how the chief minerals occur :—

LOWER LAURENTAIN.—Gneiss, quartz and feldspar in veins : galena.

UPPER LAURENTIAN.—Total thickness estimated at not less than 50,000 feet including various kinds of limestone and gneisses. Anorthosites, gneiss, limestone, actinolite, agate, amazonite, apatite, barite, bismuth, blende, bornite, celestite, chrysotile, fluorite, gold, graphite, jasper, limonite, malachite, mispickel, molybdenite, perthite, pyrallolite, pyroxene, rutile, serpentine, steatite, sphene, tourmaline, tremolite, zircon.

HURONIAN.— Total thickness estimated at 45,000 feet. Granite, syenite, jasper, mica, diorite, limesone, gold, silver, galena, iron, zinc, platinum, nickel, arsenic, bismuth, molybdenum, cobalt, sulphur, copper, barite.

CAMBRIAN.

Animikie.—About 3,000 feet in thickness. Sandstone, argillites, dolomites, iron, silver, galena.

Nipigon.—Sandstones, conglomerates, marls, copper, lead, iron.

Potsdam.—Sandstones, shale, (in this formation fossils first appear.)

SILURIAN.

Calciferous.—Magnesian limestone.

Chazy.—Sandstone, limestone, shale.

Black River and Bird's Eye.— Bituminous limestone, lithographic limestone.

Trenton.—Limestone, petroleum, gas.

Utica.—Bituminous shale, yields illuminating oil.

Hudson River—Clays, shales, marls, limestone, sandstone.

Medina.—Marls, clays, grey and red sandstone (good building stone.)

Clinton.—Grey and greenish shales, thin beds of silicious and argillaceous limestone.

Niagara.—Limestone (building and quick-lime.)

Guelph.—Dolomitic limestone (excellent for building and quick-lime.)

Onondaga.—Salt, gypsum, limestone.

DEVONIAN.

Oriskany.—Brown and grey sandstone.

Corniferous.—Limostone, petroleum, clay, iron-stone.

Hamilton.—Limestone and clays.

Chemung and Portage.—Bituminous shales.

POST TERTIARY.—Clays and gravel.

IRON.

The iron ores of Ontario are among the best in the world, being equal to the highest quality of Swedish. Large deposits are known to exist at intervals over a great part of the Province, chiefly in the forms of magnetite and homatite It occurs in various other forms, but not usually of any commercial value.

Magnetic iron ore is most commonly diffused, and for smelting purposes it has no superior. Much ore of this kind is so high in grade, and so free from deleterious ingredients that the best quality of steel may be economically produced from it. The percentage of metallic iron in some of these ores ranges from 60 to 70, and occasionally in some samples from the Belmont mine nearly 70½. From the Atik-Okan location, fifty miles west of Lac des Mille Lacs, the metallic iron runs from 63 to upwards of 70 per cent. and the ore is free from injurious combinations.

In the townships of Bagot in Renfrew county, Clarendon and Palmerston in Frontenac, Snowdon in Haliburton, Belmont in Peterborough, Wollaston, Lake, and Marmora in Hastings, the ores yield from 60 to 70 per cent., while at the same time they are practically free from phosphorus and sulphur.

Hematite and its varieties, known as micaceous, specular and earthy ores, though less abundant than magnetite, is of frequent occurrence throughout the Province. Several remarkably rich deposits have been discovered in the Ottawa Valley, and at Silver Lake, five miles north-east of Thunder Bay, it appears to exist in large quantities. Samples yield by analysis 68 to 69 per cent. of a metallic iron, with no injurious ingredients in combination.

From McNab township, Renfrew county, to Lake Nipissing, it has been observed in many places.

As limonite, brown hematite and bog iron ore it occurs much less frequently, but tolerably extensive deposits of the last named, exist at Conestoga, in the county of Waterloo, and in one or two places in Middlesex and Welland counties.

Dr. Selwyn says: "Both hematite and magnetite ores have been found in large quantities, but more magnetite than hematite. In some places they are mixed, as at the Haycock mine near Ottawa. Specular ore is also found with them to some extent. . . . . The magnetitic ores are generally associated with the Laurentian rocks, and mostly in the vicinity of crystalline limestones We find both hematite and magnetite sometimes associated with the Huronian rocks. On the Kaministiquia river a jaspery ore occurs, there is also some hematite. The last place I saw such a deposit is 28 miles east of Port Arthur. The deposits are in the nature of contact deposits, at the junction of two formations. I think the rocks in rear of Port Arthur are a continuation of Vermilion range, of Minnesota, and there is no reason why the deposits should not be as rich on the Canadian as on the American side. As I understand it, iron occurs in both the Huronian and Animikie formations; the hematite mostly in the Animikie and the magnetite mostly in the Huronian. There is iron on the north shore of Lake Nipigon. I think it is very rich, but so far as I know it has not been analyzed. . . . . It is a slaty hematite. Deposits have been opened up at Goulais Bay, and at Gros Cap, those are in the Huronian, I think. . . . . I never saw any iron in the Sudbury District. On an island in Lake Nipissing, there is what is considered to be a large deposit. I cannot say whether it is the Laurentian or not. . . . . I think the Huronian rocks are very favorable for iron ores, but some of them carry a good deal of titanium. I have heard of iron ore up the Ottawa, and it is quite likely there are such deposits. I have not examined Renfrew county or North Lanark, but Mr. Vennor mentions a good many iron deposits in that country. He found magnetite, but I do not recollect whether he found hematite; I think he did, but I am not certain. I do not think he found any bog iron. At Carleton Place there are showings of what appears to be good iron ore; it seems to lie in a fissure in calciferous (?) limestone."*

1 **Magnetite.**—"Wilbur Mine," Lot 3, Concession 13, Township of Lavant, County of Lanark; extent of deposit, 1,200 feet by 15 feet; average lots analyze 60 per cent. iron, 6.31 per cent. silica, and .009 per cent. phosphorus, but the sample exhibited will yield about 68 per cent. iron. William & Thomas B. Caldwell, Lanark.

14 **Magnetite.**—Lot 22, Concession 9, Township of Wollaston, County of Hastings; length of deposit, one-quarter of mile, breadth 25 feet. Thomas Nugent, Nugent P.O.

15 **Magnetite.**—Lot 17, Concession 8, Township of Wollaston, County of Hastings. William Jenkins, Madoc.

16 **Magnetite.**—Lot 15, Concession 2, Township of Wollaston, County of Hastings; area of deposit, 500 feet by 180 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.

17 **Magnetite.**—Lot 17, Concession 8, Township of Wollaston, County of Hastings; area of deposit, 1,500 feet by 30 to 120 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.

18 **Magnetite.**—Lot 18, Concession 8, Township of Wollaston, County of Hastings; samples from a depth of 20 feet; area of deposit, 1,500 by 40 to 60 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.

19 **Magnetite.**—Lot 15, Concession 1, Township of Wollaston, County of Hastings; length of bed, 1,200 feet, breadth from 25 to 100 feet. Jenkins & Chambers, Madoc.

20 **Magnetite.**—Township of Wollaston, County of Hastings. Jenkins & Chambers, Madoc.

21 **Magnetite.**—Lot 16, Concession 2, Township of Wollaston, County of Hastings; area of deposit, 1,400 feet by 25 to 50 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.

* Report of Royal Commission on the Mineral Resources of Ontario, 1890, p. 68.

22 Magnetite.—Township of Wollaston, County of Hastings. Jenkins & Chambers, Madoc.

92 Magnetite.—"Calabogie Mine," Lot 16, Concession 8, Township of Bagot, County of Renfrew. An analysis of one lot gave 66.34 per cent. iron, 1.04 silica, .14 phosphorus, titanium a trace, and no sulphur. Calabogie Mining Company (Ltd.), Perth. Ontario Government collection.

93 Magnetite.—Between the Canadian Pacific Railway and Amethyst Harbor, Township of McGregor, Thunder Bay District. From a bed showing seven feet and the lower rock not yet reached. It lies in the lower portion of the Animikie rocks. Ontario Government collection.

94 Magnetite.—Locations 1 and 2, Herrick's Survey, at mouth of Little Pic River, on west side, Thunder Bay District. The Canadian Pacific Railway passes through the locations. Ontario Government collection.

95 to 100 Hematite.—Lots 23 to 27, Concessions 11 and 12, Township of Darling, County of Lanark. James Bell, Arnprior.

101 Magnetite.—Atik-Okan Range, Location 402 R, Thunder Bay District. It is free from injurious combinations, and runs from 63 to over 70 per cent. of iron. The deposit forms a mountain range with the associated Huronian green schists and diorites, rising to an elevation above the surrounding plain of 50 to 125 feet, and extending along the run of the ore for nearly a mile. There are two veins of ore, with 50 feet to 60 feet of slate between, and for a good portion of the distance the veins will aggregate a thickness of 100 feet. South shore iron experts, who have examined the location, pronounce it one of the best iron deposits known. H. A. Wiley, Port Arthur.

103 to 105 Magnetite.—Lot 16, Concession 9, Township of Bagot, County of Renfrew. Ontario Government collection.

106 to 108 Specular.—Lot 29, Concession 14, Township of Clarendon, County of Frontenac. Large deposit ; fully 1,000 tons in sight. Partly developed. Allison & Platt, Adolphustown.

109 Magnetite.—Lot 17, Concession 10, Township of Portland, County of Frontenac. William Pursey, Verona.

110 Magnetic Iron Sand.—Shore of Lake Superior, between White and Cascade Rivers ; bed eight inches deep, traced for one thousand feet. F. A. Fenton, Toronto.

160 Magnetite.—Lot 27, Concession 4, Township of Snowdon, County of Haliburton. T. D. Ledyard, Toronto.

161 Magnetite.—Lot 5, Concession 6, Township of Lutterworth, County of Haliburton. T. D. Ledyard, Toronto.

163 Magnetite.—Lot 25, Concession 4, Township of Snowdon, County of Haliburton. T. D. Ledyard, Toronto.

165 Limonite.—Township of Snowdon, County of Haliburton. T. D. Ledyard, Toronto.

166 Magnetite.—Lots 13 and 14, Concession 10, Township of Bagot, County of Renfrew.

167 Magnetite.—Township of Clarendon, County of Frontenac. Allison & Platt, Adolphustown.

168 Magnetite.—Paxton Mine, Township of Lutterworth, County of Haliburton. T. D. Ledyard, Toronto.

169 Magnetite.—"Mountain Mine," Township of Lake, County of Hastings. R. C. Clute, Belleville.

170 Hematite (Specular).—Echo Lake, Thunder Bay District. P. C. Campbell, Sault Ste. Marie.

171 Magnetite.—Lot 4, Concession 9, Township of Palmerston, County of Frontenac. Surface shows 200 by 50 feet. Analysis 66 per cent. iron, 2.14 per cent. silica, and only traces of phosphorus and sulphur. Ontario Government collection.

172 Magnetite.—Wilbur Mine, Lot 4, Concession 12, and Lot 4, Concession 13, Township of Lavant, County of Lanark. Area of deposit, 1,200 feet by 15 feet ; average lots analyze 60 per cent. iron, 6.31 per cent. silica, and .009 phosphorus. W. C. Caldwell, Lanark. Ontario Government collection.

173 **Magnetite.**—Wilbur Mines, Lavant. Analysis : Magnetic oxide of iron 89.04, alumina 0.38, sesquioxide of mangancse trace, titanic acid .0, phosphoric acid trace, sulphuric acid trace, lime 1.15, magnesia 1.06, carbonic acid 1.97, silicious rock matter 6.34, total 99.94, equal to metallic iron 64.48 per cent. (Signed) Edward J. Chapman, Ph.D., at Toronto, Dec. 31st, 1879. Above property owned by William & T. B. Caldwell, Lanark, Ont.

174 **Magnetite.**—Iron Duke Mine, Township of Darling, County of Lanark, five miles from the Kingston & Pembroke Railway ; contains, by analysis. 65.33 per cent. metallic iron, .017 phosphorus, and no titanium ; extent of location, 300 acres. Wylie & Co., Carleton Place.

175 **Hematite.**—Echo Lake, Thunder Bay District. P. C. Campbell, Algoma Mills.

176 **Hematite (Specular).**—Echo Lake, Thunder Bay District. P. C. Campbell, Algoma Mills.

177 **Hematite (Kidney).**—Silver Lake, Thunder Bay District. It analyzes 68 to 69 per cent. of metallic iron, with no injurious ingredients in combination ; seems to be in large quantities, but owing to irregularity will require development to show the actual extent ; is the same kind of ore, and is in the same geological horizon as that of the famous Colley Mine on the south shore of Lake Superior. It has been explored to a small extent by mining. P. McKellar, Fort William. Ontario Government collection.

178 **Magnetite.**—Lot 25, Concession 4, Township of Snowdon, County of Haliburton.

179, 180
184, 187
191, 192
} **Magnetite.**—Belmont Mine, Township of Belmont, County of Peterboro'.

181, 183, 185, 186 **Magnetite**—Lot 25, Concession 4, Township of Snowdon, County of Haliburton. Several outcrops of ore on lots 25, 26, and 27, extending at intervals over a space of nearly three-quarters of a mile, situated on high ground overlooking the railway track, and ore may be raised and loaded on the cars for one dollar per ton. Analysis of ore from lot 25 gave metallic iron 62 per cent., sulphur .025, phosphorus a trace, and no titanium ; from lot 27, gave metallic iron 62.57, phosphorus .025, sulphur and titanium none. The Irondale, Bancroft and Ottawa Railway runs through lots 25 and 26, and in front of 27, connecting with the Midland branch of the Grand Trunk, about eight miles west of the mines. T. D. Ledyard, Toronto.

188 **Hematite**—.Township of Darling, County of Lanark. Wylie & Co., Carleton Place.

189 **Hematite.**—Township of Madoc, County of Hastings. Mrs. J. A. Wallbridge, Belleville.

190 **Hematite.**—Iron Island, Thunder Bay District. Ontario Government collection.

284 **Magnetite.**—Lot 19, Concession 1, Township of Belmont, County of Peterborough. Analysis : Metallic iron 65.10, silica 3.83, alumina 2.35, lime 2.93, magnesia 0.03, titanic acid 0.04, phosphorus 0.005, sulphur 0.07. "A railway is now being constructed to the Belmont Mines. It has been estimated that this ore bed contains over 1,000,000 tons of ore within 100 feet of the surface, and the stripping is very light. The ore bed has been thoroughly explored and of the numerous samples which I have analyzed, the above example is a fair average. It will be noticed that this ore equals the best of the famous Swedish Dannemora ore in regard to its low phosphorus contents, contains much less sulphur, and from 10 to 20 per cent. more iron." Wm. Molin, in "The Engineering and Mining Journal," Nov. 19th, 1892, p. 484. Bessemer Iron Mining Co.

301 **Magnetite.**—Lots 9 and 10 (400 acres), Concession 8, Township of Bathurst, County of Lanark. Analysis shows metallic iron 65.07, oxygen with 24.79, Water 1.48, insoluble silicious matter 6.66, soluble silica .44, sulphur .05, phosphoric acid .06, alumina .06. lime .16, undetermined and loss .34. John Hart, Perth.

302 **Magnetite.**—Atik-Okan Location (see 101), Thunder Bay District. W. W. Russell, Port Arthur.

368 **Specular.**—Township of Loughborough, County of Frontenac. W. G. Kidd collection.

370 **Magnetite**—Township of North Crosby, County of Leeds. W. G. Kidd collection.

371 **Magnetite**—Robertsville, Township of Palmerston, County of Frontenac. W. G. Kidd collection.

372 **Magnetite.**—Wilson location, Township of Lavant, County of Lanark. W. G. Kidd collection.

373 **Magnetite.**—Glendower mine, Township of Bedford, County of Frontenac. W. G. Kidd collection.

438 **Magnetite.**—Lot 31, Concession 4, Township of Snowdon, County of Haliburton. Analysis by Prof. Wm. Molin, New York, shows metallic iron 69.246, phosphorus .012, sulphur .038, titanic acid trace only. T. D. Ledyard, Toronto.

440 **Magnetite.**—Lot 27, Concession 4, Township of Snowdon, County of Haliburton.

441, 442, 444 **Magnetite.**—Belmont, County of Peterborough.

443, 446 **Magnetite.**—Lot 25, Concession 4, Township of Snowdon, County of Haliburton. T. D. Ledyard, Toronto.

447 **Magnetite.**—Lot 31, Concession 4, Township of Snowdon, County of Haliburton. T. D. Ledgard, Toronto.

477 **Magnetite.**—Robertsville Mine, Township of Palmerston, County of Frontenac. W. G. Kidd collection.

478 **Magnetite.**—Glendower mine, Janesville, County of Addington. W. G. Kidd collection.

483 **Magnetite in Calcite.**—Robertsville, Township of Palmerston, County of Frontenac. W. G. Kidd collection.

579, 581 **Magnetite (Black Bessemer).**—Easterly 90 acres of each of lots 3 and 4, Concession 9, Township of Palmerston, County of Frontenac. Property known as the "Robert's Mine," on Kingston and Pembroke Railway, about 60 miles from Kingston. Assay by J. H. Hulbert, Duluth, shows 67.3 of iron, with remarkable freedom from deleterious matter. When the mine was worked, consignments of ore were forwarded to Pittsburg, Pa., and guaranted 65 per cent. of iron, free from sulphur. The main shaft is upwards of 300 feet deep, and the ore appears to exist in immense quantities. F. W. Ferguson, Winnipeg Man.

628 **Hematite.**—Wallace Mine, north shore of Lake Huron, Algoma District. "Besides iron, this location yields copper-nickel, which lies in two parallel veins. The mine was abandoned years ago, when the nickel was not in demand. Auriferous sand is found in the foot hills of the La Cloche Mountains. The Hematite is found about 150 feet above the lake level, and 90 chains north of the copper-nickel shafts. At a depth of 16 feet the vein is 6 feet wide, and may be traced for a mile. At the eastern end it becomes niccoliferous. The property consists of 2,840 acres on the mainland, and six well-wooded islands, with every facility for making charcoal iron, or carrying on general smelting. A 20-foot channel admits the largest vessels on the lakes to the nickel shaft." Thos. Frood, Little Current, P.O., Algoma District.

749, 751 **Hematite.** (*Grey*).—Lot 7, Concession 10, Township of Portland, County of Frontenac. Ontario Government collection.

750 **Magnetite.**—Lot 7, Concession 10, Township of Portland, County of Frontenac. Ontario Government collection.

752 **Bog.**—Lot 28, Broken front Concession, Township of Gainsboro', County of Lincoln. Ontario Government collection.

763 **Hematite** (*deep red and soft*).—Lot 7, Concession 10, Township of Portland, County of Frontenac, two miles from Kingston and Pembroke Railway. Drill shows a depth of 65 feet. This ore seems well adapted to the manufacture of pigments. Ontario Government collection.

787 **Magnetite.**—Glendower Mine, Township of Bedford, County of Frontenac. Analysis gives 62 per cent. metallic iron. Good railway connection on Kingston and Pembroke Railway. Ontario Government collection.

788 **Magnetite and Hematite.**—Lot 17, Concession 10, Township of Portland, County of Frontenac. Ontario Government collection.

813 **Magnetite.**—Lot 25, Concession 5, Township of Darling, County of Lanark, Assay shows from 66 to 68.85 metallic iron, earthy matter 28.524, silica 2.60, phosphorus .026. Robert McGregor, Calabogie.

814 **Magnetite.**—Lot 38, Concession 1, Township of Clarendon, County of Frontenac. Property has not been worked. Vein from 6 to 10 feet wide; thirteen miles from Lavant station, Kingston and Pembroke railway. Ontario Government collection.

855 **Magnetite** (*large sample*).—Atik-Okan Location, Thunder Bay District. (See No. 101). A. L. Russell, Port Arthur.

859 **Hematite.**—Nipigon, Thunder Bay District. Wiley collection.

872 **Hematite.**—Lot 13, Concession 9, Township of Marmora, County of Hastings.

897 **Magnetite.**—Township of Glamorgan, County of Haliburton. Haliburton Mining Co., Toronto.

908 **Magnetite.**—Coe Hill, Township of Wollaston, County of Hastings, on the line of the Ontario Central Railway ; the deposit is about 2,000 feet long, and over 100 broad, forming a high ridge from which a large quantity of ore has been mined ; the analysis gives nearly 70 per cent. of metallic iron, with a small proportion of sulphur, but no titanium. J. D. Riddell, Supt. C. O. Railway, Trenton.

1064 to 1076 **Magnetite and Hematite.**—Cabinet specimens from various localities in Eastern Ontario. J. L. Aunger collection.

1176 **Magnetite.**—This specimen is part of a boulder found by Mr. William Jenkins of Madoc, within a few miles of that town. It is so strongly magnetic as to constitute loadstone. Jas. F. Boyle, Toronto.

1177 **Magnetite.**—Lot 10, Concession 6 (known as "The 49 Acres"), Township of Madoc, County of Hastings. Mrs. J. A. Wallbridge, Belleville.

1178 **Hematite.**—Lot 12, Concession 5, Township of Madoc, County of Hastings. Mrs. J. A. Wallbridge, Belleville.

1333 **Hematite** (*Kidney*).—S. G. Fogg, Rat Portage.

1423 **Hematite.**—Lot 2, Concession 6, Township of Sheffield, County of Addington. This mine is three-fourths of a mile from Tamworth, on the Napanee & Kingston Railway. Leonard Wager, Tamworth.

1472 **Magnetite.**—Gun Flint Lake, Thunder Bay District. This is said to be one of the largest and best iron deposits in Ontario. Several analysis show not less than 64 per cent. metallic iron, with freedom from deleterious matters. W. C. Caldwell, Lanark.

1485 **Magnetite.**—"Emily Mine," Township of Tudor, County of Hastings. Henry Johnson, Coe Hill.

1486 **Magnetite.**—"St. Charles Mine," Township of Tudor, County of Hastings. Henry Johnson Coe Hill.

1487 **Magnetite.**—"Cameron Mine," Township of Chandos, County of Peterboro'. Henry Johnson, Coe Hill.

1490 **Hematite.**—"Arthur Mine," Township of Chandos, County of Peterboro'. Henry Johnson, Coe Hill.

1492 **Hematite.**—Township of Wollaston, County of Hastings. Henry Johnson, Coe Hill.

1561 **Limonite.**—Echo Bay. Nelson Simmons, Echo Bay.

COPPER.

"The ores of copper observed in Canada are copper pyrites, the variegated sulphuret or erubescite, and the vitreous sulphuret or copper-glance, besides native copper, and small portions of the blue and green carbonates, and more rarely of the red oxyd. In the rocks of the Laurentian series copper is frequently met with in the form of yellow sulphuret. Thus in Escott, County of Leeds, this ore is found in a bed with magnetic iron and with iron pyrites, and, according to Dr. Bigsby, variegated sulphuret of copper occurs among the beds of magnetic iron on Crow Lake in Marmora. Small veins and masses of very pure copper pyrites, sometimes encrusted with the blue carbonate, occur in the crystalline limestone in several localities in the Township of Burgess, and large rolled masses of copper pyrites have been found in Gananoque Lake. In Bastard Township also small portions of this ore have been found in a vein with calcareous spar, and in similar conditions in Fitzroy. The great deposits of native copper in the Trappean rocks of the north shore of Lake Superior often present beautifully crystallized varieties, associated with calcite, prehnite and laumonite, and sometimes with red oxyd of copper, and with native silver. The veins intersecting these rocks also afford copper pyrites,

and the variegated and vitreous sulphurets of copper. The copper-bearing veins which traverse the Huronian rocks on the north side of Lake Huron, at the Bruce Mines and several adjacent localities, contain, in a gangue of quartz, the yellow, variegated and vitreous sulphurets, generally massive, but in some cases crystallized, and occasionally associated with heavy spar, calcite, and pearl-spar. Besides the ores in the veins, the yellow sulphuret is sometimes found in the beds, as at Root River, where it occurs disseminated in a greenish argillite. The diorite from White Fish Lake in like manner contains minute portions of copper pyrites, with niccoliferous magnetic pyrites and magnetic iron ore."*

The foregoing, in a general way, represents the condition of knowledge about thirty years ago† relating to the occurrence of copper. Even then companies had been organized to work the Bruce, Wallace, and Wellington Mines on Lake Huron. In 1861, 260 men were employed at the Bruce Mines, from which, in five years, nearly 6,000 tons of ore, averaging 20 per cent., had been taken. At Spanish River, Echo Lake, Root River, Lake Maskinonge, Mattagami and Wahnapitae, Mississauga River and many other places copper was known to exist.

Copper is of common occurrence in the Huronian rocks.

In 1882 it was discovered in what is generally known as the Sudbury District.‡ The ores of this district contain sulphide of nickel. (See Nickel.)

"The rocks as a rule consist of quartzites, chloritic, honblendic and talcose schists and diorites, both coarse and fine-grained, the diorites and schists being especially prevalent about Sudbury." The ore occurs in large lenticular masses, and yields from $2\frac{1}{2}$ to $3\frac{1}{2}$ per cent. of nickel, in addition to the copper, which runs from 3 to 7 per cent. of pyrites.

An important discovery of native copper has recently been made at Point Mamainse, Lake Superior, and a company has been organized to work it, with excellent prospects.

117 **Copper Nickel Matte (Bessemerized) 80 per cent. metallic.**—Copper Cliff Mine. Canadian Copper Co., Cleveland, Ohio, U.S.A. Ontario Government collection.

122-127 **See Nickel.**

244 **Copper** (*Native*).—Point Mamainse, Thunder Bay District. Lake Superior Copper Co., Sault Ste. Marie. Ontario Government collection.

250 **Copper** (*Argentiferous*) **in Spar.**—Spar Island, Lake Superior. Thunder Bay District. Ontario Government collection.

259 **See Galena.**

270 **Copper** (*Native*).—Little Current. W. S. Gibson, Little Current. Ontario Government collection.

271 **Copper Ore** (*Argentiferous*).—Spar Island, Lake Superior, Thunder Bay District. Ontario Government collection.

272 **Copper Pyrites** (*Chalcopyrite*).—Silver Lake. Ontario Government collection.

273 **Copper Pyrites.**—Gold Lake. Ontario Government collection.

274 **Copper Pyrites.**—Rainy River, Rainy River District. D. F. Burk, Port Arthur. Ontario Government collection.

275 **Copper Nickel.**—Wallace Mine, Algoma District. Thomas Frood, Little Current, Algoma.

276 **Copper Pyrites.**—Township of Denison, Algoma District. Dobson & Shaw, Toronto.

277 **Copper Nickel.**—Lake Mattagami, near Fly Post, Nipissing District. Ontario Government collection.

278 **Copper Pyrites.**—Bruce Mines. Ontario Government collection.

279 **Copper Pyrites.**—Lake Waquekobing, south of Mississauga River, on the north shore of Lake Huron, Algoma District. Ontario Government collection.

281 **Copper Ore.**—Enterprise Mine, Black Bay, Thunder Bay District. Ontario Government collection.

282 **Copper Pyrites.**—McAllister Mine, Thunder Bay District. Ontario Government collection.

*Geology of Canada, pp. 514, 515. 1863.

†The Bruce Mines were discovered in 1846.

‡Sudbury is at the junction of the Sault Ste. Marie branch of the Canadian Pacific Railway with the main line in the District of Nipissing.

283 **Copper Pyrites.**—Bruce Mines, Cathertson Location, Algoma District. Ontario Government collection.

380 **Meneghinite, or Dewarite** (*Argentiferous*).—Marble Lake, Barrie Township.

381 **Copper.**—Township of Barrie, County of Frontenac. W. G. Kidd collection.

385 **Copper Glance (Chalcocite).**—County of Frontenac. W. G. Kidd collection.

496 **Copper** (*native*) **in Calcite.**—Beaver Mine, Thunder Bay District. W. G. Kidd collection.

572 **Copper Pyrites,** (*small samples*).—Township of Wollaston, County of Hastings.. William Jenkins, Madoc.

591 (See Gold).

593 **Copper Pyrites** (*small*).—Lot , Concession 2, Township of Chandos. M. H. Powell, Marmora. Ontario Government collection.

658 **Copper Ore.**—Vermilion Mine. R. H. Ahn, Mining Broker, Toronto and Sudbury.

666 **Copper.**—R. H. Ahn, Mining Broker, Toronto and Sudbury.

697 **Copper,** (*crude*).—R. H. Ahn, Mining Broker, Toronto and Sudbury.

698 **Copper,** (*fine*) **from Nickel Ores.**—R. H. Ahn, Mining Broker, Toronto and Sudbury.

713 **Copper**—(*Chalcopyrite with Quartz*).—R. H. Ahn, Mining Broker, Toronto and Sudbury.

716 **Copper Pryites.**—Lot 12, Concession 3, Township of Denison. R. H. Ahn, Mining Broker, Toronto and Sudbury.

718-19 **Copper Ores.**—Sudbury District. R. H. Ahn collection.

743-44 **Copper.**—R. H. Ahn collection.

780 **Copper (Tetrahedrite, Meneghinite or Dewarite).**—Analysis : Copper, 40.72 ; Antimony, 20.76 ; Lead, 12.00 ; Silver, 1.00 ; Sulphur, 25.50. Lots 5 to 9, Con 9, Township of Barrie, County of Frontenac. R. Dewar, 148 York street, Toronto.

783 **Copper Pyrites,** metallic copper, 33 per cent.—Township of Dummer, County of Peterborough. J. B. McWilliams, Peterborough.

784 **Copper** (*native*).—Point Mamainse, Lake Superior, Algoma District. H. S. Sibley, 80 Griswold street, Detroit, Mich. Ontario Government collection.

852 **Copper in Red Sandstone.**—Vert Island, Lake Superior. Wiley collection.

853 **Copper in Amygdaloidal Trap.**—Blake Mine, Thunder Bay District, Wiley collection.

891 **Copper Pyrites.**—Township of Mayo, County of Hastings Ontario Government collection.

900 **Copper.**—Township of Lake, County of Hastings. Ontario Government collection.

955 **Copper Pyrites with Quartz.**—J. L. Aunger collection.

956-57 **Copper Pyrites.**—J. L. Aunger collection.

958 **Copper Pyrites with Hematite and Actinolite.**—J. L. Aunger collection.

959 **Copper Pyrites in Quartz.**—J. L. Aunger collection.

960 **Chalcocite.**—Two small specimens. J. L. Aunger collection.

961 **Copper (native), with Cuprite and Malachite.**—Five small specimens. J. L. Aunger collection.

962 **Copper** (*native*) **on Calcite.**—J. L. Aunger collection.

963 to 967½ **Copper** (*native*).—J. L. Aunger collection.

968-69 **Cuttings from block of native Copper.**—J. L. Aunger collection.

1140 **Copper.**—Dr. T. F. Chamberlain, Toronto.

1168 **Dewarite** (*Copper, Silver, Lead, Sulphur and Antimony*). The property from which the ore was taken, consists of lots 6, 7, 8, and 9, in the 9th Concession of the Township of Barrie, Count of Frontenac.

A Company has been organized to develop the location. This Company is known as the Ontario Silver and Antimony Company.

According to the analysis made by Mr. R. Dewar, Toronto, "The mineral bearing matrix is a magnesian limestone . . . . . stained with blue and green carbonate of copper, due to the decomposition of the principal mineral. . . . . This ore appears to be intermediate to chalcostibite and bournonite."

For analysis of this ore, which has been named Dewarite, see No. 780, above. Ontario Silver & Antimony Mining Co., 63 Victoria street, Toronto, John Critchley, President.

1179 **Copper** (*native*).—Point Mamainse, Lake Superior. Col. H. S. Sibley, 80 Griswold street, Detroit.

1332 **Copper** (*native*).—S. G. Fogg, Rat Portage.

1488 **Copper** (*Sulphate*).—Township of Lake, County of Hastings. Henry Johnson, Coe Hill.

1558 **Copper** (*Argentiferous*).—Webbwood, Algoma District. Nelson Simmons, Echo Bay.

1560 **Copper-Nickel (Chalcopyrite and Pyrrhotite).**—Webbwood. Nelson Simmons, Echo Bay.

1562 **Copper Pyrites.**—Echo Bay. Nelson Simmons, Echo Bay.

NICKEL.

Numerous large deposits of Nickel have recently been discovered in the Sudbury district, as well as at various other places in the Province. It is only about Sudbury where nickel mining is carried on, and here the metal is nearly always associated with copper. The Sudbury ore is of low grade, seldom yielding more than three per cent. of metal, but many samples have been assayed running as high as from 10 to 35 per cent. (See Copper).

Recent experiments in the amalgamation of this metal with steel, have considerably enhanced its value, and it is probable that the niccoliferous area of Ontario will speedily rank as the chief source of production.

From the town of Sudbury as a centre, nickel-bearing rocks have been found to extend over many hundreds of square miles, but the exact limits of the area are unknown.

The chief nickel ores of Ontario are pyrrhotite, niccolite and Gersdorffite. It may be stated that for commercial purposes pyrrhotite is the only ore worked.

10 **Pyrrhotite.**—Piece weighing about 300 lbs. Lot 2, Concession 2, Township of Nairn, Algoma District. John Hall, Nairn, Algoma.

11 **Pyrrhotite.**—Lot 1, Concession 2, Township of Baldwin, Algoma District. John Hall, Nairn, Algoma.

12 **Pyrrhotite.**—Lot 2, Concession 2, Township of Baldwin, Algoma District. John Hall, Nairn, Algoma.

23 **Nickel (?).**—Lot 15, Concession 2, Township of Wollaston, County of Hastings; area 500 feet by 25 to 50 feet. Clute and Brown, Belleville; Jenkins and Chambers, Madoc.

25 **Nickel (?).**—Lot 22, Concession 9, Township of Wollaston, County of Hastings; traced one-fourth mile in length, average breadth 25 feet, Thomas Nugent, Nugent P.O.

102 **Magnetic Pyrites, with copper and nickel.**—Near Schreiber Station, Canadian Pacific Railway, within two miles of Lake Superior; exists in considerable quantities. Wilcy and Marks, Port Arthur.

111, 112 **Pyrrhotite.**—Copper Cliff Mine. Lot 12, Concession 2, Township of McKim, Nipissing District. Ontario Government collection.

113 to 116 **Pyrrhotite and Chalcopyrite.**—Vermilion Mine, Lot 6, Concession 4, Township of Denison, Algoma District.

117 **Copper-Nickel Matte** (*Bessemerized*).—80 per cent. metallic. Copper Cliff Mine. Ontario Government collection.

118 to 121 **Pyrrhotite and Chalcopyrite.**—Copper Cliff Mine, Lot 12, Concession 2, Township of McKim, Nipissing District. Ontario Government collection.

122 to 127 **Copper-Nickel, Matte** (old process).—Copper Cliffe Mine, Township of McKim, Nipissing District. Ontario Government collection.

275 **Pyrrhotite and Chalcopyrite.**—Wallace Mine, Algoma District. Thomas Frood, Little Current.

277 **Pyrrhotite and Chalcopyrite.**—Lake Mattagami, near Fly Post, Nipissing District.

571 **Nickel (?) with Iron Pyrites.**—Township of Monteagle, County of Hastings. W. Jenkins, Madoc.

577 **Pyrrhotite.**—McConnell Mine. Rinaldo McConnell, Mattawa.

601 **Pyrrhotite.**—Worthington Mine, Township of Drury, Algoma District.

602 **Pyrrhotite and Chalcopyrite.**—North half of Lot 1, Concession 2, Township of Drury, Algoma District. Henry Totten, Toronto.

From 650 to 746, and from 777 to 779 inclusive, are the collection of Mr. R. H. Ahn, Mining Broker, Toronto and Sudbury. These specimens illustrate the various occurrences of ores in the neighborhoood of Sudbury and the different stages in the process of smelting and refining. A few of the specimens are from other localities, and are shown here for purposes of comparison.

650, 651 **Pyrrhotite.**—Wellington Mine.

652 **Surface Gossons, Pyrrhotite.**

653 **Pyrrhotite.**—Vermilion Mine.

654 **Pyrrhotite.**—Gersdorff Mine, Lot 12, Concession 3, Township of Denison, Algoma District.

655 **Diorite** associated with Pyrrhotite

656 **Millerite and Pyrrhotite.**

657 **Roasted Nickel Ore.**

659 **Pyrrhotite.**—Beatrice Mine, Township of Blezard, Nipissing District.

660 **Gersdorffite and Niccolite.**—Lot 12, Concession 3, Township of Denison, Algoma District.

661 **Pyrrhotite.**—Township of Nairn.

662 **Pyrrhotite.**—Township of Graham, Algoma District.

663 **Pyrrhotite.**—Lot , Concession 5, Township of Denison.

664 **Pyrrhotite** —Township of Blezard.

665 **Gersdorffite with Hornblende.**

667 **Pyrrhotite.**—Township of Louise, Algoma District.

668 **Pyrrhotite and Chalcopyrite.**—Vermilion Mine.

669 **Pyrrhotite** (*high grade*).—Vermilion Mine.

670, 671 **Gersdorffite, Niccolite, Pyrrhotite and Chalcopyrite.**—Lot 12, Concession 3, Township of Denison, Algoma District.

672 **Pyrrhotite** (*high grade*).—Township of Graham, Algoma District.

673, 674 **Gersdorffite, Niccolite, Pyrrhotite and Chalcopyrite.**—Lot 12, Concession 3, Township of Denison, Algoma District.

675 **Gersdorffite,** (*Crystals in Pyrrhotite*).

676 **Pyrrhotite.**—Township of Nairn. Commercial Mining Co., Toronto.

677, 678 Pyrrhotite.—High grade ore. Drury Nickel Co.
679, 682 Bessemerized Matte.
680 Cupola Slag.
681 Bessemer Nickel Slag.
From 683 to 692 inclusive, are nickel ores from foreign countries for comparative purposes.
683 Pyrrhotite.—Gap Mine, Pennsylvania.
684 Nickel Silica.—Oregon Mine, Oregon.
685 Nickel Silica.—New Caledonia.
686 Pyrrhotite Crystals.—Saxony.
687 Millerite.—Gap Mine, Pennsylvania.
688 Gersdorffite.—Spain.
689 Ullmannite (Antimony-Nickel).—Germany.
690 Niccolite.—Saxony.
691 Linnœite (58 per cent. Cobalt).—Saxony.
692 Chloanthite.—Saxony.
695 Roasted Nickel Matte.
696 Nickel Oxide.
697 Crude Copper, from Copper-Nickel Ore.
698 Refined Copper, from Copper-Nickel Ore.
699 Crude Nickel.
700 Refined Nickel.
701 Pyrrhotite.—Lowndes mine, Lot 4, Concession 5, Township of Denison.
702 Pyrrhotite.—Flett mine, Lot 5, Concession 5, Township of Denison.
703 and 704 Pyrrhotite and Chalcopyrite.
705 Millerite and Pyrrhotite, from depth of 700 feet.—Copper Cliff Mine
707 Pyrrhotite.—Lot 5, Concession 6, Township of Louise.
709 Gersdorffite and Niccolite, with diorite.
710 Gersdorffite with quartz.
711 Surface Ores.—Crescent mine, Township of Graham.
712 Surface Ores.—Lots 9 and 10, Concession 5, Township of Waters.
714 Gersdorffite.—Lot 12, Concession 3, Township of Denison.
715 Pyrrhotite.—Lot 2, Concession 4, Township of Graham.
717 Nickel Ores, weathered.
720 Gersdorffite, Chalcopyrite and Quartz.
721 Gersdorffite and Chalcopyrite.
722 Gersdorffite.
723 Gersdorffite and Millerite.
726 Pyrrhotite.—Stobie mine.
727 Pyrrhotite.—Copper Cliff mine.
728 Pyrrhotite.—Blezard mine.
729 Pyrrhotite.—Evans mine.
731 Gersdorffite, Pyrrhotite, Niccolite and Chalcopyrite.
732 Gersdorffite and Chalcopyrite in quartz.
733 Gersdorffite and Pyrrhotite.

734 Gersdorffite and Chalcopyrite in quartz.

735 Pyrrhotite and Chalcopyrite, (*surface*)

738 and 739 Pyrrhotite and Chalcopyrite.

740 Pyrrhotite.—Algoma Nickel Mining Co., Township of Lorne, Algoma District.

741 Gersdorffite, Niccolite and Chalcopyrite in quartz.

742 Gersdorffite and Pyrrhotite.

764 Pyrrhotite.—Lot 3, Concession 2 ; south half Lot 3, Concession 3 ; south half Lot 2, Concession 3 ; Lots 3 and 4, Concession 4 ; south half Lot 8, Concession 2 ; north half Lot 8, Concession 3 ; Lot 9, Concession 2, all in the Township of Drury. These properties are known as the Loughrin location, adjoining the Worthington mine. Assay made at Columbia School of Mines, New York, showed 6 per cent. of nickel and 8 per cent. of copper from specimens taken at an elevation of 200 feet from the base of the hill in which the body of ore occurs. The hill is 320 feet high. Specimens from the summit analyzed by Prof. Heys, of Toronto, yielded 4 1-16 per cent. nickel and 6 per cent. copper. The vein, at the base of the hill, is 215 feet wide, and continues up the hill, gradually diminishing at 25 feet in width. Upwards of 30 tons of ore have been taken from different elevations along the vein. Mr. Emmens examined the ore and pronounces it to be equal to anything found on adjoining properties. The Canadian Pacific Railway runs through the property, and the Worthington station switch is on one side of Lot 3, Concession 2. There is a tramway from the C.P. R. The property consists of 2,243 acres, and is owned by Loughrin, Dwyer and McGaw. Thomas McGaw, Queen's Hotel, Toronto ; P. J. Loughrin, 273 Church Street, Toronto ; John Dwyer, Whitefish P.O., Algoma.

768 Pyrrhotite.—Township of Neelon, Nipissing District. Narcisse Dubeau.

777 Pyrrhotite.—Lot 9, Concession 6, Township of Nairn.

778 Pyrrhotite.—Lot 7, Concession 1, Township of Blezard.

779 Cupola Matte.

818 Pyrrhotite.—Inez mine. This piece of ore weighs about one ton. Drury Nickel Co., Whitefish, Algoma. R. T. Travers, President, Chicago ; Thomas L. Nelson, Secretary, Boston ; A. F. Mason, Treasurer, Boston.

851 Pyrrhotite.—Schreiber, C. P. R., Algoma District. Wiley & Co., Port Arthur.

861 Pyrrhotite.—North-east quarter of north half Lot 12, Concession 4, Township of Dryden. D. McLaren, Wahnapitae.

862 Pyrrhotite.—North-west quarter of south half of Lot 6, Concession 4, Township of Neelon, Nipissing District. D. McLaren, Wahnapitae.

863 Pyrrhotite.—South half of Lot 10, Concession 1, Township of Dryden, Nipissing District. D. McLaren, Wahnapitae.

864 Pyrrhotite.—South-west quarter south half Lot 1, Concession 3, Township of Neelon, Nipissing District. D. McLaren, Wahnapitae.

865 Pyrrhotite and Chalcopyrite.—Lot 5, Concession —, Township of Garson. Creederman & McLaren, Wahnapitae.

866 Pyrrhotite.—North-west quarter Lot 11, Concession 4, Township of Dryden, Nipissing District. D. McLaren, Wahnapitae.

868 Pyrrhotite.—Neighborhood of Lake Wahnapitae. D. McLaren, Wahnapitae.

902 Pyrrhotite.—North half Lot 12, Concession 5, Township of Dryden, Nipissing District. Small specimens from three feet below the surface ; location distant 1½ miles from C. P. Railway. A stream close by would give a 25 foot head of water. Analysis shows 2.16 of nickel, with traces of gold. J. B. Dickson & Malcolm McPhee, Pembroke.

953 Pyrrhotite.—Two small cabinet specimens. J. L. Aunger collection.

954 Pyrrhotite and Chalcopyrite.—Small specimen. J. L. Aunger collection.

CANADIAN COPPER COMPANY'S TROPHY.

From 1102 to 1137 inclusive are exhibited by the Canadian Copper Company, and form a magnificent trophy.

"The Canadian Copper Company may be considered the pioneer company in the development of the nickel mining and smelting industry in the Sudbury District. During the winter months of 1885 and 1886 this company was organized to operate several copper mining properties, to wit : The Copper Cliff mine, The McAllister (now the Lady Macdonald) mine, and the McConnel mine. Active operations were entered upon in the spring of 1886, the attention more particularly centering upon the Copper Cliff mine, at which mine considerable work was done and the shipment of 3,000 tons of copper ore therefrom during the latter part of the summer to refiners in New York. It was only upon the treatment of this shipment of copper ore that the presence of nickel in considerable quantities was discovered. During the summer's operations large quantities of pyrrhotites, which carried a very small per cent. of copper, and was thus consigned to the waste dump, was found to form the chief matrix of the nickel contents, and thus proved to be the most valuable portion of the ore body instead of being valueless.

"During the summer of 1886 other valuable mining properties were absorbed by this company, to wit : The Evans Mine, The Stobie Mine, The Beaver Mine, or better known as Lot 6 in the sixth Concession of the Township of McKim, also the Frood Mine on the lot adjoining, viz. : South half Lot 7 in the before-mentioned sixth concession, also the Creighton property. Mining operations were continued in a desultory way pending a market for the new commodity until the season of 1888, when much more activity was displayed and the first blast furnace for the treatment of this grade of ore was constructed and an extensive roasting yard laid out and constructed by them in the vicinity of the Copper Cliff Mine, under the plans and supervision of Dr. E. D. Peters, Jr. The following year a second blast furnace was erected, and in 1891 a cupola with a set of converters was added to the furnace plant for the further treatment of the matte produced by the blast furnaces.

"In the interim other large mining properties were amalgamated with or became controlled by this company to such an extent that at this time no less than 15,000 acres of mineral lands in this district are either absolutely owned or controlled by this company, and comprise at least eleven or twelve well-known and extensive deposits carrying nickel, of which only three have as yet been developed and made to produce ore in an unlimited quantity, and the remainder are only awaiting the market for the metal ere they will be opened up to furnish their quota of the ore.

"This company is by far the largest producer of nickel on this continent, and can very materially increase its output whenever the state of the nickel market warrants it."

1102 Mass of nickel ore from Copper Cliff Mines, taken from the fifth level, or from a depth of 500 feet, and weighing about 6,000 pounds.

1103 Mass of copper-nickel ore from the Evans Mine, taken from the third level, or from a depth of 175 feet, and weighing about 12,000 pounds.

1104 Mass of nickel ore from the Stobie Mine, taken from the stope at the end of the tunnel, being at the level of the surface workings, and weighing about 8,000 pounds.

1105 Ten semi-spherical masses of matte, the product of the water-jacket and blast furnaces, each piece weighing about 600 pounds, or 6,000 pounds in all.

1106 Ingot of nickel cast at the Company's works, and weighing 4,500 pounds.

1107 Coarse crushed copper-nickel ore from the Copper Cliff Mine, as prepared for roasting.

1108 Raggings from Copper Cliff Mine, being the second screenings in the crushing process.

1109 Fines from Copper Cliff Mine, being the first screenings in the crushing process.

1110 Coarse ore from the Evans Mine.

1111 Raggings from the Evans Mine.

1112 Fines from the Evans Mine.

1113 Coarse Ore from the Stobie Mine.

1114 Raggings from the Stobie Mine.

1115 Fines from the Stobie Mine

1116 Copper-Nickel, Vermilion Mine.

1117 Sand carrying grains of Arsenide of Platinum (Sperrylite), Vermilion Mine.

1118 Sperrylite (Arsenide of Platinum) from the sand at the Vermilion Mine.

1119 Nickel Ore (Pyrrhotite), as roasted, preparatory to smelting.

1120 Copper-Nickel Matte from the blast furnaces, contained 18 per cent. copper and 22 per cent. Nickel.

1121 Slag from blast furnaces.

1122 Copper-Nickel Matte, the product of the converters, containing 42 per cent. copper, and 40 per cent. nickel.

1123 Nickel Oxide.

1124 Shot Nickel.

1125 Pig Nickel.

1126 Ingot Nickel.

1127 Nickel Anodes.

1128 Electrolytic Nickel.

1129 Shot Copper-nickel alloy.

1130 Pig Copper-nickel alloy.
1131 Ingot Copper-nickel alloy.
1132 Copper nickel anodes.
1133 Electrolytic Copper.
1134 By-products of furnaces.
1135 Manufactured articles nickel-plated.
1136 Manufactured articles of copper-nickel alloy.

From 1146 to 1155 are from Professor Stephen H. Emmens of the Emmens Metal Company, Youngwood, Pa.

1146 Folgerite.
1147 Blueite.
1148 Whartonite.
1149 Niccoliferous Pyrrhotite.
1150 Niccoliferous Pyrrhotite (heap roasted).
1151 Niccoliferous Pyrrhotite.
1152 Once-run Matte from roasted Pyrrhotite.
1153 Bessemerized Matte from roasted Pyrrhotite.
1154 Concentrates from Gossanized Pyrrhotite.
1155 Purified Nickel Oxide.
1156 Refined Nickel.
1158 Acid proof nickel.
1159 Nickel Ammonium Sulphate.

1287 Pyrrhotite, Wahnapitae.
1288 " " J. S. Cryderman, Wahanpitae.
1290 Pyrrhotite, surface specimens, Lots 10 and 11, Concession 3, Township of Trill. Ralph Gillespie, White-Fish, or Worthington.
1370 Pyrrhotite. D. O'Connor, Sudbury.
1559 Pyrrhotite, Garden River, Algoma District. Nelson Simmons, Echo Bay.
1560 See Copper.

ZINC.

This occurs in the form of blende or sulphuret. Associated with galena it has been found in small quantities in calcite. In the Trenton and Niagara limestones it appears sometimes in small amber-colored masses, occasionally occupying fossil matrices, or being enclosed in gypsum nodules.

On the north shore of Lake Superior, zinc-blende occurs extensively in lodes from two to sixteen feet in width and of unknown length. On Pie Island commanding the entrance to Thunder Bay, there is a fissure vein varying from two to eight feet wide. Here mining has been carried on to a depth of two hundred feet, low grade ore being abundant all the way down, and in some places showing bunches of native and glance silver. Animikie clay slate is the country rock. Near the north-east angle of Thunder Bay, at what is known as the Zinc-Blende Lake Location, the vein is six feet wide, carrying argentiferous zinc-blende and galena. That the vein is well-defined was shown some years ago when several shafts were sunk to depths of from ten to twenty feet.

At the Zenith Mine, north of Nipigon Bay, Lake Superior, there are two lodes, from two to sixteen feet wide. This location is ten miles from the Canadian Pacific Railway, and equally distant from a harbor on Lake Superior.

128 **Zinc Blende.**—Zenith Mine, Algoma District. Ontario Government collection.

245 **Zinc Blende** with native and glance silver.—McKellar Island. Ontario Government collection.

246 **Zinc Blende.**—Zinc Blende Lake, Thunder Bay District. Ontario Government collection.

247 **Zinc Blende.**—Zenith Mine, Thunder Bay District. Ontario Government collection.

248 **Zinc, silver and lead.**—Lawn Mine, Calumet Island. J. & C. Russell, Renfrew.

599 See Silver.

ANTIMONY, LEAD AND SULPHUR

1168 **Antimony** (*Tetrahedrite, with silver, copper, lead and sulphur*)—Lots 6, 7, 8, 9, Concession 9, Township of Barrie, County of Frontenac.

This antimonial ore varies in some important respects from what is known as Meneghinite, and the name Dewarite has been suggested.

It yields by analysis, copper 40.72, antimony 20.76, lead 12.00, silver 1.00, and sulphur 25.50.

The vein carrying this ore is of considerable extent, and is now being worked by the company making the exhibit. Ontario Silver and Antimony Mining Co., 63 Victoria Street, Toronto.

GALENITE, GALENA OR LEAD ORE.

Dana says : "All galenite is more or less argentiferous, and no external characters serve to d stinguish the kinds that are much so from those that are not."

"Logan says : "The only ore of lead met with in Canada is the sulphuret or galena. This is found in many localities on Lake Superior, as at Prince's Mine, Thunder Cape and Pointe des Mines, where it occurs in small quantities in veins, often associated with blende and with iron and copper pyrites. This galena sometimes contains a notable proportion of silver. Veins holding galena are found in very many localities cutting the Laurentian limestones as in the Township of Bedford, Lansdowne and Ramsay. The gangue of the galena in these veins is calcareous spar, and more rarely sulphate of barytes. Small portions both of blende and of copper pyrites are associated with the lead at Ramsay. This vein traverses the dolomites of the calciferous formation, and from its resemblance to those of Bedford and Lansdowne, which occur in the older Laurentian system, it is probable that all of these latter are more recent than the Calciferous formation."*

Notwithstanding the large number of lead veins known in Ontario, none are now worked. For some years the Frontenac mine in Loughborough was worked successfully. The vein (calc-spar) is from 12 to 15 feet in width, through which the galena is pretty well distributed. It yielded five ounces of silver per ton of galena, the latter being equivalent to about twelve per cent. of the total vein matter.

Lead occurs also in Ramsay Township, various parts of Haliburton, and in the neighborhood of Lake Temiscaming, besides at Goulais River, Straight Lake, Echo Lake, Dorion Township and numerous other points in Thunder Bay and Algoma Districts.

Rich silver-bearing galena has recently been discovered in the Township of Barrie, County of Frontenac.

Ores are mentioned as argentiferous when the percentage of silver is high enough to make the working profitable in the extraction of the latter metal.

24 **Galena**—Lot 8, Concession 7, Township of McTavish, Black Bay, Thunder Bay District. Duncan McEachen.

81 **Galena and Copper.**—Enterprise Mine, Location C, Township of McTavish Black Bay, Thunder Bay District. Ontario Government collection.

249 **Galena**—Dorion Mine, Thunder Bay District. Charles Johnson, Port Arthur. Ontario Government collection.

251 **Spar, with Lead and Pyrites.**—Thunder Bay, Thunder Bay District. Ontario Government collection.

*Logan's Geology of Canada, p. 56, 1863.

256 **Galena.**—Cariboo Mine, Thunder Bay District. Ontario Government collection.

257 **Galena** (*Argentiferous*).—Lot 8, Concession 4, Township of Ramsay, County of Lanark. (Silver from 4 to 16 oz. per ton.) W, H. Wylie, Carleton Place. Ontario Government collection.

258 **Galena**—Silver Islet Mine. J. McIntyre, Fort William. Ontario Government collection.

259 **Galena, with Gold, Silver and Copper.**—Enterprise Mine, Thunder Bay District. John McIntyre, Fort William. Ontario Government collection.

260 **Lead** (*two small bars*).—From Frontenac Mine ore. A. Gunn & Co., Kingston. Ontario Government collection.

261 **Galena** (*Argentiferous*).—Little Pic Silves Vein, Thunder Bay District. Ontario Government collection.

262 **Galena**—Black Bay, Township of McTavish, Thunder Bay District. Ontario Government collection.

263 **Galena** (*Argentiferous*).—Victoria Mine, Echo Lake, Thunder Bay District. Ontario Government collection.

377 **Galena** (*Argentiferous*).—49 ounces of silver per ton ; Township of Grimsthorpe, County of Frontenac. W. G. Kidd collection.

573 **Galena** (*Argentiferous small samples, roughly fused*).—Township of Barrie, County of Frontenac. W. Jenkins, Madoc.

578 **Galena.**—Lot 229, Concession 14, Township of Tudor, County of Hastings. (The location is within a short distance of the Central Ontario Railway). W. Tucker, Madoc.

765 **Galena.**—Lot 17, Concession 6, Township of Bedford, County of Frontenac. A shaft has been put down 60 feet. There are six leads of 100 acres. The property is six miles from a railway track, connected with Kingston and Pembroke Railway. Ontario Government collection.

766 **Galena** (*Argentiferous*).—Township of Barrie, County of Frontenac. This ore will average about 25 ounces of silver and 65 per cent. lead to the ton. The vein is in crystalline limestone with slate casings, and is about 15 feet in width. The solid ore is about 24 inches wide. John McFee, Belleville.

838 **Galena.**—Ogema Mine, Thunder Bay District. Wiley & Co., Port Arthur.

948 **Galena** (*three small specimens*).—J. L. Aunger collection.

1142 **Galena.**—Township of Bedford, County of Leeds. Dr. T. F. Chamberlain, Toronto.

1161 **See Gold.**

1168 **See Antimony.**

1190 **Galena**—Island in Cross Lake, Nipissing District ; yield 30 ounces of silver and 70 per cent. lead per ton. A. J. Cockburn, Toronto.

1286 **Galena** (*Argentiferous*).—Islands A and B, Cross Lake, Nipissing District. A. J. Cockburn, Toronto,

1491 **Galena.**—Township of Tudor, County of Hastings. Henry Johnson, Coe Hill.

SILVER.

"The Animikie rocks are of great importance, as being the silver-bearing formation of Ontario. Nearly all the veins cutting these rocks bear a strong resemblance to one another in the nature of the gangue which fills them, so much so that these veinstones may be said to form one of the characteristics of the formation. They are generally open or drusy, brecciated and very crystalline, consisting in most cases of white quartz and calcspar mixed with fragments of the wall rock and a smaller proportion of green and purple fluor-spar ; but in some instances, as in McKellar's Island, and in most of the veins on the islands and mainland between Thunder Bay and Pigeon Point, white barytes forms one of the principal constituents. A part of the crystalline quartz is almost invariably amethystine, and this color has also been imparted to the quartz crystals of the veins in the older rocks of the neighborhood, once covered by the Animikie,

which is not the case in similar veins at a distance, showing that the character of veins may be influenced by the rocks above. . . . . The silver occurs native in grains, threads and small branching forms, and as argentite in leaves and small masses, but occasionally in large crystalline lumps as at Rabbit Mountain Mine. . . . . The associated sulphides in nearly all the veins are blende, galena, copper and iron pyrites, and their relative proneness to carry silver has been found by many assays to be in the order in which they are here mentioned. In the same way they have also been found to be richer in silver in proportion as they are more closely associated with the visible silver itself, and to contain very little when remote from the rich ore in the vein. No law governing the conditions or mode of occurrence of the silver in the veins has yet been discovered, and its apparently sporadic distribution in them makes necessary to prospect extensively under ground in each case before a vein can be pronounced valuable or otherwise. . . . . The first discovery of silver of any consequence on Lake Superior was made by Mr. Peter McKellar in the autumn of 1866, at what afterwards became Thunder Bay Mine.*

Fort William and Port Arthur on Lake Superior, with Canadian Pacific Railway connections, are almost in the centre of a section of country occupied by the Animikie formation. This section extends from Silver Islet on the east to Whitefish Lake on the west. At Silver Islet, east of Thunder Cape, a mine was worked successfully for some years, during which upwards of $3,000,000 worth of silver was taken from it.

Among the other mines that have been worked, or are now working, may be named the Badger, Beaver, Big Harry, Cariboo, Peerless, Little Pig, Porcupine, Crown Point, Silver Creek, Silver Fox, Elgin, Silver Mountain East, Silver Mountain West, Y.I., and Shuniah or Duncan. Locations where silver is known to exist are too numerous to mention, but the district may be roughly described as extending from Lake Temagami on the east to the Lake-of-the-Woods on he West.

In Eastern Ontario rich silver-bearing galena has been discovered in the Township of Barrie. It is said to yield nearly $100 of silver per ton. An antimonial ore in the same township yields upwards of $200 in silver per ton.

80 **Silver.**—Gopher Mine, South-half section 11, Concession 4, Township of Strange, Thunder Bay District. (Shaft sunk 104 feet). Ontario Government collection.

82 **Silver vein matter, showing crystallizations of iron and pyrites and dog-tooth spar.**—Lily of the Valley Mine, Township of Paipoonge, Slate River Valley.

Two fissure veins of quartz and calcite carrying galena, zinc-blende, iron and copper pyritess with native silver and silver glance, the latter in nuggets, sometimes weighing several ounce, in weight. Assay $300 to $500 per ton. Henry Parsons. Ontario Government collection.

83-86 **Silver Glance.**—Rabbit Mountain Mine, (six miles from Stanley Station), Thunder Bay District Assay from $500 to $2,000 per ton. Daniel McPhee. Ontario Government collection.

87 **Silver.**—Star Mine, south-half section 10, Concession 4, Township of Strange, north side of White Fish Lake, Thunder Bay District. (Shaft sunk 60 feet). Ontario Government collection.

89-91 **Silver.**—West End, Silver Mountain, location R. 56 Lybster. No. 2 shaft is 140 feet deep. The level at 90 feet from the surface runs in veins to the west 350 feet, and to the east 180 feet ; whole length of drift 530 feet, showing well in silver all the way, with Spar vein large, 4 to 8 feet. Another drift at a depth of 40 feet each way from shaft yields rich silver. Ontario Government collection.

248 **Silver, lead and zinc.**—Lawn Mine, Calumet Island. J. C. Russell, Renfrew.

250 **See Copper.**

271 **See Copper.**

295 **Silver, Gold and Tellurium.**—Township of Drury, Algoma District. Miller & Clark, Sault Ste. Marie.

380-381 **Meneghinite (?)** (*Argentiferous*).—This ore contains copper, antimony and sulphur, besides silver. Marble Lake, Township of Barrie, County of Frontenac. W. G. Kidd collection.

423 **Silver** (*Native*).—Silver Islet, Thunder Bay District. W. G. Kidd collection.

*Report of Royal Commission on the Mineral Resources of Ontario, pp. 33, 34.

492 **Silver, argentite and native.**—Silver Islet, Thunder Bay District. W. G. Kidd collection.

573 **See Galena.**

599 **Silver, Lead and Zinc.**—Ottawa Valley. J. & C. Russell, Renfrew.

737 **Silver Ore.**—Lot 11, Concession 5, Township of Creighton. R. H. Ahn collection.

745 **Silver Ore.**—Thunder Bay District. R. H. Ahn collection.

766 **See Galena.**—John McFee, Bellville.

774 **Silver Glance.**—Beaver Mine, Thunder Bay District. Hon. A. S. Hardy, Toronto.

775 **Silver, native and glance, in gangue, showing the thickness of vien.**—Beaver Mine, Thunder Bay District. Hon. A. S. Hardy, Toronto.

776 **Silver, rich native, reticulated.**—Silver Mountain Mine, Thunder Bay District. Hon. A. S. Hardy, Toronto.

From 820 to 859 are exhibited by Wiley & Co., Port Arthur.

820 **Silver,** (*Native*).—80 pounds, cut in two pieces and polished ; Beaver Mine, Thunder Bay District.

821 **Silver** (*Native*).—Badger Mine, Thunder Bay District.

822 **Silver,** (*Native, Argentite and Zinc-blende*).—Badger Mine, Thunder Bay District.

823 **Silver,** (*Native in Calcite.*)—Porcupine Mine, Thunder Bay District.

824 **Silver,** (*Native in Quartz*).—Badger Mine, Thunder Bay District.

825 **Silver,** (*Native in Quartz*).—Climax Mine, Thunder Bay District.

826 **Silver,** (*Native and Zinc-blende in Quartz*).—Badger Mine, Thunder Bay District.

827 **Silver,** (*Native Animikite and Galena*).—Silver Islet, Thunder Bay District.

828 **Silver,** (*Native and Animikite in Manganese Spar.*)—Silver Islet, Thunder Bay District.

829 **Silver,** (*Argentite in Quartz*).—Beaver Mine, Thunder Bay District.

830 **Silver,** (*Native in Calcite.*—Climax Mine, Thunder Bay District.

831 **Silver,** (*Native in Calcite.*—Climax Mine, Thunder Bay District.

833 **Silver** (*Native*).—Badger Mine, Thunder Bay District.

834 **Silver** (*Native*).—Porcupine Mine, Thunder Bay District.

835 **Silver,** (*Argentite and Black Slate*).—Cloud Lake, Thunder Bay District.

836 **Silver,** (" *Bonanza Ore*").—Beaver Mine, Thunder Bay District.

837 **Silver,** (*Native Leaf*).—West End Mine, Thunder Bay District.

839 **Silver,** (" *Bonanza Ore*").—Beaver Mine, Thunder Bay District.

840 **Silver** (*Native*).—Badger Mine, Thunder Bay District.

841 **Silver** (*Argentite*).—Climax Mine, Thunder Bay District.

842 **Silver** (*Native*).—Wiley Mine, Thunder Bay District.

843 **Silver** (*Native and Zinc-blende*).—Porcupine Mine, Thunder Bay District.

844 **Silver** (*Native and Zinc-blende*).—Porcupine Mine, Thunder Bay District.

845 **Silver** (*Argentite*).—Beaver Mine, Thunder Bay District.

846 **Silver** (*Native and Animikite*) —Silver Islet, Lake Superior, Thunder Bay District.

847 **Silver** (*Argentite*).—Jarvis Island, Lake Superior, Thunder Bay District.

849 **Silver** (*Arsenical*).—Point Porphyry, Thunder Bay District.

850 **Silver** (*Animikite in Manganese Spar*).—Silver Islet, Thunder Bay District.

856 **Silver** (*Stephanite*).—Badger Mine, Thunder Bay District.

857 **Silver** (*Argentite*) nine pieces.—Cloud Lake, Thunder Bay District.

858 **Silver** (*Argentite Nugget*).—Beaver Mine, Thunder Bay District.

952 **Silver** (*Native*) very rich.—J. L. Aunger collection.

1157 **Silver Nickolum.**

1244-1245 **Silver Ore** (*Concentrates*).—Victoria Mine, Bruce Mines. Ontario Government collection.

1168 **See Copper.**

1321 to 1331 Silver Ore and Native Silver from various mines and locations in Thunder Bay District. Mrs. S. G. Fogg, Rat Portage.

1558 **See Copper.**

For other argentiferous specimens see Galena.

GOLD.

The first notable discovery of gold in Ontario was made in 1866, in the township of of Madoc, The late Mr. H. G. Vennor, F.G.S., referring to this location said the gold occurs in "a series of crevices or openings in a gold-bearing bed, formed of chloritic and epidotic gneiss holding patches of dolomite and calcspar, the openings being nothing more than such as are often met with in the dolomites and calc-schists of this region." A considerable quantity of gold was taken from this mine, although it speedily became exhausted. Other discoveries in the same neighborhood soon followed. In the townships of Marmora, Kaladar, Elzevir, Lake, Tudor and Belmont, the precious metal has been found. At Deloro in Marmora, the Gatling or Consolidated Company erected extensive works for the purpose of extracting gold from a mispickel ore yielding from $20 to $40 per ton, but partly owing to the difficulty of separating the metal from the sulphide of arsenic, and partly on account of disagreement among the members of the company, the work has been abandoned.

More recently a vein of auriferous quartz, from two to five feet wide, has been discovered on lot 2, concession 1, township of Belmont, and satisfactory tests have been made by the South African Gold Mining Co. The vein matter consists largely of iron pyrites, the proportion of which seems to increase with the depth, now fully eighty feet. The company has erected test machinery at Marmora village, a few miles from the mine. The plant consists of a Gates crusher and four small Crawford extractors. Many tons of ore have been subjected to treatment, the result being upwards of ten dollars per ton of 2,000 pounds.

The silver and copper ores of Lake Superior, at two or three points, had yielded traces, but since 1871, when Mr. Peter McKellar, of Fort William, guided by a hint from an Indian, discovered gold near Jackfish lake in Moss township, numerous other locations have been found at widely separated points, in the Districts of Rainy River, Thunder Bay and Algoma.

About 1877 it was discovered on Hay Island, Lake of the Woods, and a specimen assayed by Mr. Hoffman, of the Geological Survey of Canada, yielded "37.318 ounces of gold and 1.431 ounces of silver to the ton of 2,000 pounds."

In 1888 gold was discovered at the southern extremity of Lake Wahnapitae, Dr. R. Bell, referring to this location, says: "It occurs in several narrow veins of white quartz cutting a highly feldspathic reddish quartzite, resembling fine grained granite, but distinctly classic or fragmental in origin. . . . . One of these little veins shows a good deal of mispickel and some iron pyrites in crystals along one side of it. An assay of a sample from this vein, made by Mr. Hoffman, chemist of the Geological Survey, yielded at the rate of 5.425 ounces of gold, and 0.223 of an ounce of silver to the ton of 2,000 pounds, while the quartz from another of these veins showed neither gold nor silver."

Among the numerous localities where gold is now known to exist in paying quantities, may be named Partridge Lake, near Lac-des-Mille-Lacs; Victoria Cape, Jackfish Bay; Goulais Bay and Batchawana Bay, near the eastern end of Lake Superior; the Vermillion Mine in Denison township, near Sudbury; Sultana and other mines, Lake of the Woods; Boulder Lake Mine; Osinawe Gold Lode: Mocan Gold Lode; Cameron, Hawkeye, Gold Hill, Craig, Winnipeg, Consolidated, Williams, Rainy Lake, Heron Bay, Thessalon River, Ophir Mine in Galbraith township; Wahnapitae Lake; Creighton and Fairbanks townships; Lake Gordon district; Marmora and Belmont.

264 **Gold-bearing quartz.**—Lake of the Woods, Rainy River District. D. F. Burk, Port Arthur. Ontario Government collection.

265 **Gold-bearing quartz.**—Winnipeg Consolidated Mine. Alex. Matheson, Rat Portage. Ontario Government collection.

266 **Gold-bearing quartz.**—Woodchuck Mine, Lake of the Woods, Rainy River District. Robert Bunting. Ontario Government collection.

267 **Gold-bearing quartz.**—Mocan Gold Lode, Lake Superior, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

268 **Gold-bearing quartz.**—Jackfish Bay, Lake Superior, Thunder Bay District. P. McKellar, Fort William. Ontario Government collection.

269 **Gold Ore.**—Boulder Lake, Lake of the Woods, Rainy River District. William Gibbons, Port Arthur. Ontario Government collection.

285 **Gold-bearing quartz.**—Osinawe Gold Lode. McKellar Bros., Fort William. Ontario Government collection.

286 **Gold-bearing quartz.**—Sultana Mine, Lake of the Woods, Rainy River District. Ontario Government collection.

287 **Gold-bearing Mispickel.**—Lots 7, 8 and 9, township of Marmora, County of Hastings. Cooke & Hope, Marmora. Ontario Government collection.

288 **Gold-bearing rock with free gold.**—Crescent Mine, township of Marmora, County of Hastings. Ontario Government collection.

289 **Gold-bearing quartz.**—(Said to yield $50 per ton) Partridge Lake, Thunder Bay District. P. McKellar, Fort William. Ontario Government collection.

290 **Gold-bearing quartz.**—($50 per ton) Osinawe Lake, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

291 **Gold-bearing quartz.**—Partridge Lake, Thunder Bay District. Ontario Government collection.

292 **Gold Ore.**—Lake of the Woods, Rainy River District. D. F. Burk, Port Arthur. Ontario Government collection.

293 **Gold-bearing quartz.**—Portage West, Lake of the Woods, Rainy River District. Keewatin Mining Co. Ontario Government collection.

294 **Gold-bearing quartz.**—Lake of the Woods, Rainy River District. William Gibbons, Port Arthur. Ontario Government collection.

296 **Gold-bearing quartz.**—Jackfish Bay, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

297 **Gold-bearing quartz.**—211 P. Mine, Lake of the Woods, Rainy River District. Oliver Donais, Port Arthur. Ontario Government collection.

298 **Gold Ore.**—Huronian Mine, township of Moss, Thunder Bay District. Ontario Government collection.

382 **Gold—free in Mispickel.**—Township of Marmora, County of Hastings. Ontario Government collection.

383 **Gold-bearing Mispickel.**—Township of Marmora, County of Hastings. Ontario Government collection.

384 **Gold-bearing Mispickel.**—Township of Marmora, County of Hastings. Ontario Government collection.

388 **Gold free in quartz.**—Township of Elzevir, County of Hastings. Ontario Government collection.

585 **Gold - bearing Ore.**—Demarse Mine, township of Marmora, County of Hastings. M. H. Powell, Marmora. Ontario Government collection.

586 **Gold, free.**—Demarse Mine, township of Marmora. County of Hastings. M. H. Powell, Marmora. Ontario Government collection.

587 **Gold-bearing Ore.**—Lot 18, Concession 5, township of Madoc, County of Hastings. M. H. Powell, Marmora. Ontario Government collection.

588 **Gold.**—*(two pieces)* Lot 12, Concession 2, township of Madoc. Reduces readily to oxide of iron when heated. M. H. Powell, Marmora.

589 **Gold.**—Big Island, Belmont Lake, County of Hastings. M. H. Powell, Marmora. Ontario Government collection.

591 **Gold and Copper.**—Lot 10, Concession 11, township of Marmora, County of Hastings. M. H. Powell, Marmora. Ontario Government collection.

600 **Gold in Iron Pyrites.**—Township of Marmora, County of Hastings. Carpenter & Bell, Marmora. Ontario Government collection.

617 **Gold** *(Mispickel crystals)*—Township of Marmora, County of Hastings. W.G. Kidd collection.

693 **Gold Ores.**—Wahnapitae. R. H. Ahn, Mining Broker, Toronto and Sudbury.

694 **Gold Ores.**—Wahnapitae. R. H. Ahn, Mining Broker, Toronto and Sudbury.

706 **Gold Ore.**—Vermilion Mine. R. H. Ahn, Mining Broker, Toronto and Sudbury

771 **Gold, free in iron oxide on quartz.**—Sultana Mine, Lake-of-the-Woods.

772, 773 **Gold free**—Lake Wahnapitæ, Nipissing District. Hon. A. S. Hardy, Toronto.

781 **Gold in Alluvial Sand.**—Fire assay of 25 grains gave .004 per cent or one ounce, 3 dwt., 8 grains per ton of 2,000 pounds, being equivalent, if pure, to $24.10 per ton. District of Algoma. Thompson & Monahan. Victoria and Lombard Sts., Toronto.

786 **Gold-bearing Mispickel.**—Gatling 5 acres, lot 8, concession 8 Township of Marmora. W. H. Wylie, Marmora. Ontario Government collection.

860 **Gold**—Location 2. R. 3., Township 40, Nipissing District, D. McLaren, Ontario Government collection.

867 **Gold-bearing quartz.**—Unsurveyed land near Lake Wahnapitæ. D. McLaren.

873 to 889 **Gold-bearing Mispickel.**—Various locations in Township of Marmora. Ontario Government collection.

890 **Gold-bearing Mispickel.**—Township of Faraday, Hastings County. Ontario Government collection.

892 **Gold-bearing Mispickel.**—Ontario Government collection.

896 **Gold-bearing Mispickel.**—Township of Dungannon, Hastings County. Ontario Government collection.

970 **Gold, free, with Arsenopyrites in quartz.**—J. L. Aunger collection.

971 to 977 **Gold, free in quartz.** (small specimens.)—J. L. Aunger collection.

978 **Gold with pyrite in quartzite.**—J. L. Aunger collection.

979 to 982 **Gold, with pyrite and arsenopyrite in quartz.**—J. L. Aunger collection.

1091 **Gold, free in black Argillite.**—J. L. Aunger collection.

1100 **Gold bearing quartz.**—Bull Dog Mine, near Pipe Stone Bay, Lake-of-the-Woods, Rainy River District. C. G. Morris, Toronto.

1101 **Gold-bearing quartz.**—Rossland Mine, near Pine Portage Bay Lake-of-the-Woods, Rainy River District. C. G. Morris, Toronto.

1161 **Stephanite (Gold, Silver, Tellurium, Antimony, Lead).**—Huronian Mine, Moss Township, Thunder Bay District. Chas. E. Eschweiler, 101 Farwell Ave., Milwaukee, Wis.

1183 **Gold-bearing quartz.**—Lots 11, Concessions 3, 4 and 5, Township of Creighton, District of Algoma.

'The vein varies in width from 15 to 150 feet and can be traced for over two and a half miles. It occurs in a talcose formation. The country rock accompanying the gold bearing ore, is a schist conglomerate. Both the hanging and foot-walls are well defined.

A shaft has been sunk on the vein, the present depth of the shaft being 106 feet. The main body of the ore is low grade, but the average in the portion of the vein nearest the foot-

wall is $365.91 per ton of gold, besides considerable quantities of silver. The assays vary from $273.62 per ton to $543.05. The average of the remaining portion of the vein, not taking into account the rich streak, is $4.91 per ton. The estimated cost of working the ore is less than $3.00 per ton, "or if on a large scale the cost would not exceed $1.50 per ton." J. M. Clark, 27 Wellington St. East, Toronto.

1274 **Mispickel** (*Concentrates*).—Deloro Mine, Township of Marmora, Hastings County. Ontario Government collection.

1291 **Gold-bearing quartz and sulphurets.**—Belmont Mine, Peterborough County. A. W. Carscallen & M. Crawford, Marmora.

The Belmont Gold Mine is now worked by Mr. M. Crawford the inventor of the Crawford Gold Extractor. This property is only one of many in the same neighborhood where the "show" of gold is quite as good.

"Although the vein was only two feet wide at a depth of 100 feet, it is now five feet wide at a depth of 125 feet. The first hundred feet yielded from ten to fifteen per cent sulphurets, the last twenty five feet gives from 25 to 50 per cent, with free gold in every bucketful raised.

The last four assays made of this ore (exclusive of free gold samples) gave respectively $50, $120, $400 and $500 per ton.

Owing to the small amount of development yet done, only thirty men are now (January 1893), employed, but as soon as spring opens, both plant and labor will be considerably increased.

The property consists of 150 acres, on Lots 1 and 2, Concession 1, Township of Belmont, Peterborough County. There are several other equally good outcrops of ore on the lots."

1292 **Gold.**—Ophir Mine, Lot 12, Concession 3, Township of Galbraith, Algoma District. The Trend of the vein is west, 15 degrees south; the dip is south 40 to 45 degrees, length of the vein exposed at workings 557 feet; depth 208 feet; average width of vein 36 feet. Tons of ore mined, 1500; in sight upwards of 300,000 tons. Nine openings have been made.

Altitude above Lake Huron, 450 feet. Location three miles east and twelve miles north of Bruce Mines.

The ore will be concentrated on the ground, and the concentrates forwarded to the smelter. the free gold will be milled at the mine.

The "Ophir" Company is organized with W. H. McCormick of Chicago President; A. E. Humphreys, Duluth, Vice-President; George E. Milligan Duluth, Secretary-Treasurer: G. J. Atkins, General Manager and Colonel W. R. Wallace, Superintendent and Manager of the Mining Department (P. O. Address, Bruce Mines, Ont.)

RAT PORTAGE EXHIBIT OF GOLD.

This collection is illustrative of the various and numerous gold-bearing locations about the Lake-of-the-Woods. The exhibit is made by the Rat Portage municipality, and includes the private collection of Mr. S. G. Fogg.

During the past year much has been added to our knowledge regarding the rich auriferous deposits of Rainy River District, and it is probable that in the near future gold mining will be carried on here with great activity.

1293 to 1320, and 1348 to 1352, and from 1456 to 1461, and 1465.—**Rich gold** specimens from various mines and locations about the Lake-of-the Woods, Rainy River District, including Ophir, White Elephant, Pine Portage, Bad Mine, Il Divir, Boulder Island, X 42, Quarry Island, Bull-dog, New Era, Winnipeg Consolidated, Treasure, Oliver Donais, Gold Creek, and Gold Hill.

1352 **Gold Ore.**—Lots in first concession, Township of Balfour, Algoma District.

The mineral vein in this concession extends many miles both east and west, and is at least a quarter of a mile wide, the whole deposit being well mineralized.

In some places there are slate hills about forty feet high. Assays show that the deposit carries from $6 to $11 per ton of gold, besides small quantities of silver.

In addition the ore also carries platinum in paying quantities.

The strike of the deposit which has been explored for several miles is about east and west.

On one side of the deposit the country rock is a volcanic breccia and on the other an agglomerate schist.

Mining on the property would be simply an open rock cut and would be better described as quarrying. The estimated cost of mining, crushing and treating the ore would not exceed two dollars per ton.

The deposit is less than two miles from the main line of the C. P. R., and is easily reached from either Chelmsford or Larchwood. J. R. Gordon, C. E., box 234, Sudbury.

1354 **Gold in Mispickel** (*large specimens.*)—Gatling Four Acres, Township of Marmora, Frontenac County. W. H. Wylie, Marmora.

1355 **Gold** (*native.*)—Eastern Ontario. J. L. Aunger collection.

1427 **Gold, Silver and Copper.**—Otterhead, Thunder Bay District. T. H. Ince, Toronto.

From 1456 to 1461, and 1465 are part of the collection from the Town of Rat Portage.

1473 **Gold** (*hanging wall.*)—Sultana Mine, Lake-of-the-Woods. Rainy River District. Dominion Mining Co., Rat Portage.

1474 **Gold** (foot-wall.)—Sultana Mine, Lake-of-the-Woods, Rainy River District. Dominion Mining Co., Rat Portage.

1475 **Gold** (*rock outside of hanging wall.*)—Sultana Mine, Lake-of-the-Woods.

1476 **Gold Quartz** (*vein matter.*)—Sultana Mine, Lake-of-the-Woods, Rainy River District. Dominion Mining Co., Rat Portage. (The width of the vein is 27 feet.)

1477 **Gold Quartz.**—Woolwich Mine, Lake-of-the-Woods, Rainy River District.

1478 **Gold Quartz.**—Victoria Mine, Clearwater Bay, Lake of-the-Woods. D. M. Murphy and A. Woods, Rat Portage.

1482 **Gold Quartz** (*large specimens.*)—No locality given. Rat Portage collection.

1483 **Gold, Mispickel.**—Township of Dungannon, County of Hastings. Henry Johnson, Coe Hill.

1484 **Gold Quartz (carrying also silver and copper.)**—Dungannon Township, Hastings County. Henry Johnson, Coe Hill.

PLATINUM.

Sperrylite.—This is an arsenide of platinum, which has been named by Professor L. Wells, after its discoverer, Mr. F. L. Sperry. Platinum had not hitherto been found as an important constituent, otherwise than it alloys with the other metals of the platinum group. The following is Mr. Sperry's own account of its occurrence :

"The mineral was found at the Vermilion Mine in the District of Algoma . . . a place 22 miles west of Sudbury and 24 miles north of Georgian Bay, on the line of the Algoma branch of the Canadian Pacific Railway. The mine was discovered in October, 1887, and a three stamp-mill was put up for the purpose of stamping gold quartz. Associated with this gold ore are considerable quantities of pyrite, chalcopyrite and pyrrhotite, and at the contact of ore and occupying small pockets in decomposed masses of the ore, there is a quantity of loose material composed of gravel containing particles of copper and iron pyrites. It was in milling this loose material that several ounces of the arsenide of platinum were gathered on the carpet connected with the stamp-mill."

Mr. Wells says : "Nearly all the grains of the new mineral showed extremely brilliant crystal faces, though most of the crystals were fragmentary ; in size they were mostly between 05 and .5 mm. (1/500 and 1/50 inch) in diameter.

The color of the mineral is nearly tin white, or about the same as that of metallic platinum ; the fine powder is black.

After giving the details of the chemical analysis, Mr. Wells continues : "The composition is consequently represented by the formula Pt As 2, a small portion of the platinum and arsenic being replaced respectively by rhodium and antimony. In composition this mineral appears to be nearer Wohler's laurite than any other mineral now known."

Professor S. L. Penfield writes : "The crystalline form of sperrylite is isometric ; pyritohedral. Simple cubes are common, octahedrons are exceptional, while the majority of the crystals,

which are usually fragmentary, show combinations of cube and octahedron. . . . . Taken in connection with the chemical results the mineral takes a place in our classification in the pyrite group, where an atom of a metal, usually Fe, Co, or Ni is united with two atoms of either S, As, or rarely Sb or an isomorphous mixture of them. As this is the only time that platinum has been found in combination as a mineral, it may be noted that Fe, Co, and Ni, and the metals of the platinum group fall in the same series in Mendelejeff's periodic system of the elements, which gives additional grounds for putting this mineral in the pyrite group.

The hardness of the mineral is between 6 and 7, which was determined by placing selected crystals on a bright feldspar surface, pressing down on them with a soft pine stick and rubbing back and forth ; the sperrylite repeatedly cut the feldspar, but could not be made to scratch quartz."

724 **Platinum** (*Sperrylite*) **sand.**—R. H. Ahn, mining broker, Toronto and Sudbury.

725 **Platinum,** (*Sperrylite in test tube*).—R. H. Ahn, mining broker, Toronto and Sudbury.

1117 **Sand from Vermilion Mine, carrying grains of Sperrylite.**—Canadian Copper Co.

1118 **Sperrylite** (*as washed and separated from the sand*).—Canadian Copper Co.

1353 **Platinum bearing Ore.**—Lot 4, Concession 1, Township of Balfour, Algoma District.

The platinum bearing rock on this lot extends east and west and is at least a quarter of a mile wide ; the whole deposit being well mineralized. In some places there are slate hills about forty feet high. Assays show the deposit to carry on an average 1 oz 2 dwt. per ton of platinum.

In addition the deposit carries from $6 to $11 per ton of gold, besides small quantities of silver.

The strike of the deposit which extends several miles is about east and west.

On one side of the deposit the country rock is a volcanic breccia and on the other agglomerate schist. This breccia is of the same character as that seen in the cuttings where the C. P. R. crosses the Onaping 23 miles west of Sudbury Junction. Mining on the property would simply be an open rock cut and would be better described as quarrying.

The deposit is less than two miles from the main line of the C. P. R.

The estimated cost of mining, crushing and treating the ore would not exceed $2 per ton. J. R. Gordon, C. E., box 234, Sudbury.

CRYSTALLOGRAPHY.

352 **Molybdenite Crystal.**—Township of Petawawa, County of Renfrew. W. G. Kidd collection.

Pyrite, etc.—88 **Pyrite in Calcite.**—Gopher mine, south half of section 11, concession 4, Township of Strange. (Shaft sunk 104 feet). Ontario Government collection.

276 See **copper.**

406 **Pyrite on Calcite.**—Frontenac Lead Mines, County of Frontenac. W. G. Kidd collection.

411 **Pyrite** (*Single Octahedron*).—Lake Openicon, Township of Storrington, County of Frontenac. W. G. Kidd collection.

452 **Pyrite on Calcite.**—Thunder Bay District. W. G. Kidd collection.

485 **Pyrite on Calcite.**—Beaver Mine, Thunder Bay District. W. G. Kidd collection.

497 **Pyrite.**—Wilbur Mine, Township of Lavant, County of Lanark.

499 **Pyrite on Calcite.**—Thunder Bay District.

522-3 **Pyrite.**—Used in the manufacture of Sulphuric Acid. Standard Fertilizer and Chemical Co., Smith's Falls.

590 **Pyrite** (*Auriferous*).—Concession 2, Township of Chandos, County of Peterborough. M. H. Powell, Marmora.

854 **Arsenopyrite** (*Mispickel*).—Schreiber, Algoma District. Wiley & Co. Port Arthur.

1043-44 **Pyrite with Calcite and Apatite**.—J. L. Aunger collection.

1045 **Pyrite**, globular concretion.—J. L. Aunger collection.

1046 **Pyrite**, semi-globular concretion.—J. L. Aunger collection.

1047 **Pyrite and Hematite**, globular concretions (two specimens).—J. L. Aunger collection.

1048-59 **Pyrite** in cubes from $\frac{3}{8}$ inch to 1 inch.—J. L. Aunger collection.

1060 **Pyrite with Magnetite**.—J. L. Aunger collection.

Fluorite.—469 **Fluorite on Amethystine quartz**.—Thunder Bay District. W. G. Kidd collection.

493 **Fluorite**.—Newburgh, County of Leeds. W. G. Kidd collection.

928 **Fluorite, Calcite and Marcasite**.—J. L. Aunger collection.

---

407 **Quartz crystals**.—Thunder Bay District. W. G. Kidd collection.

459 **Smoky Quartz**.—Thunder Bay District. W. G. Kidd collection.

607 **Quartz Geode**. Township of Oso. W. G. Kidd collection.

616 **Quartz**. (*Smoky*) **black tourmaline, apatite, mica and calcite**.—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

730 **Quartz**.—Used as furnace lining. R. H. Ahn, Mining Broker, Toronto and Sudbury.

From 909 to 925 and 1087 to 1090 inclusive, are from the cabinets of J. L. Aunger, Esq., Blairton. The specimens are mainly illustrative of Eastern Ontario.

909 **Quartz with calcite**.

910 **Quartz crystals**.

911 **Quartz crystals**.

912-13 **Quartz on calcite with hematite**.

915 **Quartz with pyrite**.

916 **Quartz crystals with pyrite**.

917 **Quartz crystal, abnormal form**.

918 **Quartz, partly amethyst, with calcite, pyrite and hematite**.

919 **Quartz with limonite**.

920 **Quartz with lines of hematite**.

921 **Quartz on calcite** (*two specimens*).

922 **Quartz crystals, various** (*eight specimens*).

923 **Quartz, chalcedony, calcite and oxides of iron**.

925 **Quartz with pyrite**.

1087-1090 **Quartz crystals**.

1185 **Quartz crystals**.—Thunder Bay District. James F. Boyle, Toronto.

1186 **Quartz crystal** (*large, single terminations*).—Thunder Bay District. James F. Boyle, Toronto.

When quartz crystals are purple, violet or wine colored, they are known as amethysts. The coloring matter is due either to the presence of maganese or iron and soda.

Beautiful specimens are found in various localities along the north shore of Lake Superior, in the District of Thunder Bay.

Amethyst.—405 **Amethyst with pyrite and calcite crystals**—W. G. Kidd collection.

408 **Amethyst**—Thunder Bay District. W. G. Kidd collection.

409 **Amethyst**—Nipigon, Thunder Bay District. W. G. Kidd collection.

459 **Smoky "topaz"**—Thunder Bay District. W. G. Kidd collection.

626-27 **Amethyst**—Nipigon, Thunder Bay District. W. G. Kidd collection.

914 **Quartz,** *Amethystine (five small specimens).*

1184 **Amethyst**—Amethyst Harbor, Thunder Bay District. James F. Boyle, Toronto.

1289 **Amethyst** (*very large specimen.*)—Thunder Bay District. D. F. Burk, Port Arthur.

1336 to 1344 **Amethysts**—Rat Portage collection.

1347 **Amethyst with pyrites spar**—Rat Portage exhibit.

---

367 **Spinel in calcite**—Newburgh, County of Addington. W. G. Kidd collection.

---

951 **Manganese** (*Pyrolusite*)—J. L. Aunger collection.

---

239 **Calcite, with galena or pyrite**—Thunder Bay, Thunder Bay District. Ontario Government collection.

240 **Calcite crystals**—Jarvis Island Mine. John McIntyre, Fort William.

333 **Calcite**—Lake Openicon, County of Frontenac. W. G. Kidd collection.

346 **Calcite, green spar**—Township of Fitzroy, Carlton. W. G. Kidd collection.

454 **Calcite crystals on amethystine quartz**—Thunder Bay District. W. G. Kidd collection.

455 **Calcite crystals on pyrite**—Thunder Bay District. W. G. Kidd collection.

456 **Calcite** (*dog tooth spar*)—Township of Hinchinbrooke, Frontenac County. W. G. Kidd collection.

461. **Calcite.**—Beaver Mine, Thunder Bay District. W. G. Kidd collection.

462-464.—**Calcite (Iceland spar).**—Township of Hinchinbrooke, County of Frontenac. W. G. Kidd collection.

490 **Calcite.**—Lake Openicon, Township of Storrington, County of Frontenac. W. G. Kidd collection.

1020 to 1041 **Calcite**—Illustrative of its various occurrences, pure and in combination with other substances. J. L. Aunger collection.

1141 **Calcite with Pyrite.**—Dr. T. F. Chamberlain, Toronto.

1143 **Calcite Crystals.**—Dr. T. F. Chamberlain, Toronto

1335 **Calcite.**—S. G. Fogg, Rat Portage.

---

254 **Rhodochrosite** (*Rose Spar*), **Argentiferous** *small specimens.* McKellar Island, Thunder Bay District. Ontario Government collection.

---

341 **Feldspar and pyroxene crystals.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

374 **Feldspar crystal.**—Township of Bedford, Frontenac County. W. G. Kidd collection.

473 **Feldspar, sphene, apatite, pyroxene and calcite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

474 **Feldspar** (*used as emery*).—Township of Pittsburg, County of Frontenac. W. G. Kidd collection.

574 **Feldspar.**—Lot 3, Concession 8, North Burgess Township, County of Lanark. W. J. Morris, Perth. Ontario Government collection.

575 **Feldspar.**—Lot 8, Concession 9, Township of Leeds, County of Leeds, one and a half miles east of Seeley's Bay, on the Rideau Canal. Wm. Pearce, Seeley's Bay P. O. Ontario Government collection.

609 **Feldspar** (*single crystal*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

613 **Feldspar** (*group of crystals*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

815 **Feldspar.**—Lot 11, Concession 4, Township of Clarendon, County of Frontenac. Ontario Government collection.

Perthite.—"A flesh-red adventurine feldspar, consisting of interlaminated albite and orthoclase." Dana.

"So-called perthite, a banded red and white feldspar, found in large cleavable individuals, the white layers, of one or two millimeters in thickness, are albite, and the similar red ones, an admixture of orthoclase and microcline, coloured by included lamina of hematite." Hunt's Systematic Mineralogy, 1891, p. 268.

It is found in small quantities in the County of Lanark, Ontario, and received its name from Perth, the county town near which it was first discovered.

It has been used in the manufacture of breast pins, cuff buttons and other articles of jewelry; good specimens selling as high as one dollar per square inch in the rough state.

33, 34, 337, 338, 561 **Perthite.**—Lot 5, Concession 6, and Lot 8, Concession 6, Township of N. Burgess, County of Lanark.

---

612 **Orthoclase** (*group of crystals*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

789 **Orthoclase** (*large crystals*).—Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. Ontario Government collection.

Microcline 450 **Microcline** (*aventurine feldspar*).—Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. Ontario Government collection.

621 **Nicrocline** (*adventurine feldspar*).—Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. Ontario Government collection.

358, 359, 620 **Amazon stone.**—Lake Clear, Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

619 **Amazon stone with pyrite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

---

340 **Labradorite.**—(From a boulder on Sharbot Lake. W. G. Kidd collection.

---

345 **Albite.**—Township of South Crosby, County of Leeds. W. G. Kidd collection.

---

334 **Pyroxene crystal.**—Sydenham Lake, County of Frontenac. Ontario Government collection.

---

335 **Pyroxene crystal.**—Eganville, County of Renfrew. Ontario Government collection.

336 **Pyroxene crystal.**—Sydenham Lake, County of Frontenac. Ontario Government collection.

341 See Feldspar.

342 **Pyroxene in calcite.**—Township of N. Crosby, County of Leeds. Ontario Government collection.

436 **Pyroxene with apatite.**—Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. Ontario Government collection.

457 **Pyroxene crystals.**—Eganville, County of Renfrew. Ontario Government collection.

614 **Pyroxene** (*Group of Crystals*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

932-934 **Pyroxene.**—J. L. Aunger collection.

935-938 **Pyroxene** (*weathered*).—J. L. Aunger collection.

241 **Hornblende Crystals in mass.**—Township of Clarendon, County of Frontenac. Ontario Government collection.

404, 410, 487, 489 **Hornblende Crystals** (*cluster*).—Eganville, County of Renfrew. W. G. Kidd collection.

592 **Hornblende.**—Township of Lake, County of Hastings. M. H. Howell, Marmora. Ontario Government collection.

608 **Hornblende** (*group of crystals*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

611 **Hornblende Crystals.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

615 **Hornblende** (*cluster of crystals*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

906 **Hornblendic Rock (Auriferous).**—Analysis :—Gold, $3\frac{3}{4}$ dwt. ; silver, 10 oz. $2.80 per ton ; Lot 28, Concession 1, Township of Miller, County of Frontenac. E. F. Coxwell, Toronto. Ontario Government collection.

929 **Hornblende** (*var. actinolite*).—J. L. Aunger collection.

929 **Hornblende** (*Pseudomorph after Augite*).—J. L. Aunger collection.

486 **Tremolite.**—Madoc, County of Hastings. W. G. Kidd collection.

490 **Tremolite** (*Actinolite*), long bladed crystals. J. L. Aunger collection.

942 **Tremolite.**—J. L. Aunger collection.

583 **Sodalite (polished specimens).**—Lot 15, Concession 13, Township of Dungannon, County of Hastings. T. D. Ledyard Toronto.

392 **Garnet** (*yellow*), **Garnet as well as Zircon is sometimes known as Hyacinth.**—Eganville, County of Renfrew. W. G. Kidd collection.

393 **Garnet** (*purple*) **for comparison.**—British Columbia. W. G. Kidd collection.

394 **Garnet** (*very dark*).—Calabogie, County of Renfrew. W. G. Kidd collection.

395 **Garnet** (*grey*).—Calabogie, County of Renfrew. W. G. Kidd collection.

790 **Garnet in slab of gneiss.**—Found as drift in Township of Sebastopol. County of Renfrew. Alex. Parks, Eganville.

930, 931 **Garnet,** (*var., Essonite seven specimens*).—J. L. Aunger collection.

343 **Scapolite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

484 **Scapolite.**—Lake Clear, Township of Sebastopol. W. G. Kidd collection.

Wilsonite.—"Wilsonite is in a pinite pseudomorph, with the form and cleavage of scapolite ; lustre somewhat pearly ; color rose red ; fragments translucent. . . . . First found by Dr. Wilson, of Perth, in Bathurst Township, Ontario." Dana.

35 **Wilsonite.**—County of Lanark. Ontario Government collection.

219 **Wilsonite.**—Township of Bathurst, County of Lanark. Ontario Government collection.

329 **Wilsonite.**—Foxton Mine, Township of Loughborough, County of Frontenac. W. G. Kidd collection.

330 **Wilsonite.**—Foxton Mine, Township of Loughborough, County of Frontenac. W. G. Kidd collection.

331 **Wilsonite.**—Township of Bathurst, County of Lanark. W. G. Kidd collection.

494 **Wilsonite.**—Foxton Mine, Township of Loughboro', County of Frontenac. W. G. Kidd collection.

400 **Vesuvianite (Idocrase).**—Township of Fitzroy, County of Carleton. W. G. Kidd collection.

401, 402 **Vesuvianite.**—Township of Bedford, County of Frontenac. W. G. Kidd collection.

389 **Zircon.**—Township of Sebastopol, County of Renfrew. Ontario Government collection.

390 **Zircon.**—Lake Clear, Township of Sebastopol, County of Renfrew. Ontario Government collection.

391 **Zircon** (*sometimes called Hyacinth*)—Lake Clear, Township of Sebastopol, county of Renfrew. (Used in jewellery.) Ziron is one of the least alterable of minerals, as it contains no protoxyds and only the most insoluble of peroxyds.

359 **Prehnite.**—North shore Lake Superior. W. G. Kidd collection.

242 **Tourmaline** (*black*).—Township of Bathurst, County of Lanark. Ontario Government collection.

387 **Tourmaline in Pyroxene.**—Foxton Mine, Township of Loughborough, County of Frontenac. W. G. Kidd collection.

398 **Tourmaline** (*black*).—Verona, County of Addington. W. G. Kidd collection.

399 **Tourmaline** (*black*).—Foxton Mine, Township of Loughborough. W. G. Kidd collection.

403 **Tourmaline** (*black*).—Verona, County of Addington. W. G. Kidd collection.

468 **Tourmaline** (*black*).—Foxton Mine, Township of Loughborough. W. G. Kidd collection.

949 **Tourmaline** (*black*).—J. L. Aunger collection.

950 **Tourmaline** (*two small crystals*).—J. L. Aunger collection.

361 **Mica,** *Muscovite.*—Section of a crystal ; Martin's Mine, County of Peterborough. W. G. Kidd collection.

362 **Mica, Monoclinic Crystal.**—Martin's Mine, Strong Lake, County of Peterborough. W. G. Kidd collection.

1187 **Mica,** *Muscovite.*—Abnormal form of crystal ; Township of Methuen, County of Peterborough. James F. Boyle, Toronto.

1188 **Mica,** *Muscovite.*—Beautiful monoclinic crystal ; Township of Methuen, County of Peterborough. James F. Boyle, Toronto.

396 **Sphene or Titanite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

397 **Sphene.**—Minden, County of Haliburton. W. G. Kidd collection.

458 **Sphene** (*section of a sixty pound crystal*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

491 **Sphene in red calcite.**—Lake Clear, Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

622 **Sphene, twin crystals.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

623 **Sphene and Hornblende in Calcite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

1062, 1063 **Sphene.**—J. L. Aunger collection.

625 **Cyanite.**—Lake Wahnapitæ, Algoma District. Cyanite or Kyanite when blue and transparent and in sufficiently large pieces, is employed as a gem, and somewhat resembles sapphire. W. G. Kidd collection.

332 **Barite crystals.**—Frontenac Lead Mine, County of Frontenac. W. G. Kidd collection.

832 **Barite crystal.**—McKellar Island, Lake Superior, Thunder Bay District, Wiley & Co., Port Arthur.

894 **Barite.**—Eastern Ontario. Ontario Government collection.

927 **Barite crystals on quartz and hematite.**—(Two specimens). J. L. Aunger collection.

943 **Barite, group of crystals, coated with carbonate of lime.**—J. L. Auger collection.

944 **Barite, single crystal, perfect termination.**—J. L. Aunger collection.

1042 **Barite crystals encrusted with carbonate of lime.**—J. L. Aunger collection.

1098 **Barite with calcite.**—J. L. Aunger collection.

Celestite.—347 **Celestite.**—Four fragments of nodule in Black River limestone, Fort Hill, Kingston. W. G. Kidd collection.

348 **Celestite.**—Black River limestone, Kingston. W. G. Kidd collection.

1061 **Wolframite.**—J. L. Aunger collection.

BUILDING, MONUMENTAL AND ORNAMENTAL STONES.

In material of this description, Ontario is particularly rich. Many excellent varieties of limestone, freestone and sandstone occur. The first named yields an excellent quality of quicklime. The Guelph dolomites are well adapted for building purposes. The hard, close-grained, Kingston limestone is quarried from beds varying in thickness from six inches to a foot, and although of a dark grey color when fresh, it bleaches to an agreeable whitish hue in the course of a few years.

At many places the crystalline limestone is fine enough to work as marble. At Dorion in Thunder Bay District, it is of a flesh color, variegated with veins. Elsewhere in the same district is found an argillaceous limestone of a milk white, banded with pale grey, and of a rich brown and pale green (mottled), known as Penessie Marble. Another variety, called "Serpentine Marble," possesses good colors, but does not take a high polish.

Renfrew County yields the largest quantity of marble for commercial purposes. At Renfrew village there is a good quarry of beautifully mottled grey material, and at Arnprior in the same county, the stone is of a dark grey color lightened with veins of white.

Good marble, black, white and pink is found at Madoc in the County of Hastings, and Barrie township in Frontenac County.

At Cornwall, on the River St. Lawrence, a fairly good quality of black "marble" is now worked, by the Canadian Granite Co., of Ottawa.

Extensive deposits of Medina sandstone are worked at the Forks of the River Credit in the County of Peel. The new Provincial Parliament Buildings are built of this stone.

Several points along the north shore of Lake Superior yield sandstone of the very best quality. One of these is at Vert Island, which has supplied the material for some of the finest buildings in Chicago.

Good granite, rich in color and free from flaws, is found in many places. West of Fort William it occurs of a brownish grey in some localities, elsewhere it inclines to a pale purple.

Near the City of Kingston the color strongly resembles that of Peterhead granite, but is a brighter red.

Black Syenites are found along the north shore of Lake Superior.

GRANITE, GNEISS, SYENITE, ETC.

With regard to most of these specimens, it may be stated that they have been procured from the surface, and are thus, presumably, not so good in color or texture as might be expected if samples were taken from a greater depth.

At various points along the line of the Canadian Pacific Railway, in the Districts of Nipissing, Thunder Bay and Rainy River, there are exposures, many of which will no doubt yield material of considerable commercial value.

2 **Syenite.**—Six-inch cube, dressed and polished ; exists in considerable quantity within two miles of the Canadian Pacific Railway, near McKenzie Station, Thunder Bay District. Ontario Government collection.

3 **Porphyry**.—Six-inch cube, dressed and polished. Coarse whitish feldspar crystals, marked with brown spots, in a black hornblendic matrix. This stone has a striking appearance; the markings are well defined, and the colors come out in correspondingly sharp contrast; near McKenzie Station, C. P. R., Thunder Bay District. Ontario Government collection.

4 **Pyenite**.—Small block, dressed and polished; in color a mottled pink and grey; coarsely crystalline, and of very handsome appearance; near McKenzie Station, C. P. R., Thunder Bay District. Ontario Government c llection.

5 **Pyenite**.—Small block, dressed and polished. This specimen is a rich pink in color, and close grained, but does not take a very high polish; near McKenzie Station, C. P. R., Thunder Bay District. Ontario Government collection.

1480 **Granite** (*red*).—Large, rough-hewn block.—No locality given. Rat Portage collection.

1481 **Granite** (*grey*).—Large, rough-hewn block.—No locality given. Rat Portage collection.

40 **Volcanic Breccia**?—Three samples, polished on one side, A considerable exposure of this rock occurs on the property of Mr. David Allan, at Rylstone, in the Township of Seymour, near the north-east angle of Northumberland County. Ovate patches of pale green, purple, pink, drab, and various other tints make a unique mosaic in contrast with the darker ground color.

Two of these specimens are beautifully illustrative of flaw and cementation. The breaks traverse the "crystals," and the displacement is strikingly marked. Ontario Government collection.

41 **Granite**.—(Banded, Gneissoid), Block $5\frac{1}{2}$ x $5\frac{1}{2}$ inches, dressed and polished.

42 **Granite**.—Block $9\frac{1}{2}$ x $10\frac{1}{2}$ x 7 inches, dressed and polished.

These two specimens are from one mile west of Ignace Station on the C. P. Railway, or 150 miles west of Fort William. The material is said to exist in immense quantities. Ontario Government collection.

43 **Granite**.—Block 5 x $5\frac{1}{2}$ x 8 inches, dressed and polished. This and No. 202 from the same locality, may be described as wine-colored, rather than red. The stone is of fine grain, and seems to be well adapted for monumental work, pillars, etc. It exists in area of many square miles forming mounds, cliffs, and hills from 50 to 500 feet in height, to the west of Pearl River Station in Township of McTavish, west of Black Bay, Lake Superior. Ontario Government collection.

37 **Granite**, (*red*).—Block 6 x 10 x $6\frac{1}{2}$ inches, dressed and polished; Kingston. Ontario Government collection.

173 **Granite**, (*red*).—Round column, 7 inches high and 5 inches in diameter; Kingston. Ontario Government collection.

201 **Granite**, (*red*).—Seven-inch cube, dressed and polished; Kingston. Ontario Government collection.

202 **Granite**, (*red*).—Six-inch cube dressed and polished; Pearl River Station, Thunder Bay District. (See No. 43.) Ontario Government collection.

203 **Granite**, (*grey*).—Seven-inch cube, dressed and polished. Canadian Granite Co., Ottawa. Ontario Government collection.

357 **Granite**, (*red*).—Cabinet specimen; Kingston. W. G. Kidd collection.

630, 631 **Granite**, (*red*).—Two turned columns, four feet high; Deadman's Bay, near Kingston. Canadian Granite Co., Ottawa.

The Canadian Granite Company has in operation the latest improved machinery for cutting, turning and polishing granite and marble for architectural and monumental purposes.

Granolithic, silicate, baritic, and other artificial stones are manufactured by the Company.

A. McLEAN, President.
J. C. ROGER, Secretary-Treasurer.
C. J. ROGER, Manager.

632 **Granite,** (*pale red*).—Plain column and base, South Bay, Lake Nipissing. Canadian Granite Company, Ottawa.

811 **Granite,**(*red*).—Tapering pillar, 22 inches high and 6 inches square at base, polished ; Kingston. Ontario Government collection.

1438-1439 **Granite,** (*red*).—Two 'arge blocks, dressed ; polished on one side, Renfrew County. W. C. Caldwell, M.P.P., Lanark.

(The location from which these specimens were taken is an extensive one. The quality and color of the stone are excellent.")

1440-1452 **Granite.**—Small polished specimens from various localities in the Counties of Frontenac and Lanark. W. C. Caldwell, Lanark.

1453 to 1470.—Granite, small specimens, illustrative of various localities in Ontario, from Lake Huron to the Ottawa Valley. W. C. Caldwell, Lanark.

1471 **Granite,** (*red*).—large block, dressed and polished on one side, north shore of Lake Huron. W. C. Caldwell, M.P.P., Lanark.

JASPER.

9 **Jasper.**—Small rough block, one side polished ; deep red, with veins of pale and dark brown ; surface specimen. Location 299, adjoining Location Y 5, north of Whitefish Lake ; bed horizontal, lies near the base of the Animikie formation. Ontario Government collection.

234 **Jasper Conglomerate.**—County of Grenville. Ontario Government collection.

235 **Jasper Conglomerate.**—Bruce Mines, Algoma District. Ontario Government collection.

236 **Jasper,** (*red*).—Bruce Mines, Algoma District. Ontario Government collection.

237 **Jasper,** (*dark red*).—Thunder Bay, Thunder Bay District. Ontario Government collection.

238 **Jasper Conglomerate.**—Thunder Bay, Thunder Bay District. Ontario Government collection.

924 **Jasper,** (*yellow*).—J. L. Aunger collection.

SANDSTONE AND FREESTONE.

49 to 51 **Freestone,** (*grey*).—Six-inch cubes dressed. Credit Forks Quarries, Township of Caledon, County of Peel ; forty miles north-west of Toronto on C.P.R. Railway. Carroll & Vick, Toronto. Ontario Government collection.

52 to 54 **Freestone.** (*brown*).—Six-inch cubes dressed. Township of Caledon, County of Peel. Carroll & Vick, Toronto. Ontario Government collection.

55 **Freestone,** (*banded*).—Dressed block ; (near Perth, Township Bathurst, County of Lanark. Ontario Government collection.

132 **Sandstone.**—Dressed six-inch cube. Vert Island, Lake Superior. Chicago and Vert Island Stone Co , Port Arthur. Ontario Government collection.

133 **Sandstone,** (*banded*).—Half dressed six-inch cube. Township of Bathurst, near Perth, County of Lanark. P. M. McDonald, Perth. Ontario Government collection.

134 **Freestone.**—Dressed six-inch cube. Credit Forks, County of Peel. Carroll & Vick, Toronto. Ontario Government collection.

139 **Sandstone, Argillaceous.**—Indian Mission Quarry, McKay's Mountain Thunder Bay. Ontario Government collection.

193 **Sandstone,** (*red*).—Small rough block. near Kingston. C. F. Gildersleeve Kingston. Ontario Government collection.

194 **Sandstone,** (*red*).—Small dressed block. Cataraqui Quarries, Township of Pittsburg, County of Frontenac. Ontario Government collection.

195 **Sandstone,** (*white*).—Small rough block. Thunder Bay. McKellar Bros., Fort William. Ontario Government colllection.

196 **Sandstone,** (*white*).—Small rough block. Thunder Bay. McKellar Bros., Fort William. Ontario Government collection.

197 **Sandstone, white.**—Half dressed six-inch cube. Rossport, Nipigon Bay, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

198 **Sandstone,** (*red*).—Dressed six-inch cube. Vert Island, Lake Superior. Chicago and Vert Island Stone Co., Port Arthur. Ontario Government collection.

200 **Freestone.**—Dressed six-inch cube. Credit Forks, County of Peel. Carroll and Vick, Toronto. Ontario Government collection.

214 **Sandstone,** (*red and buff-banded*).—Cataraqui Quarries. C. F. Glidersleeve, Kingston. Ontario Government collection.

215 **Sandstone,** (*small, rough block*).—Thunder Bay, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

243 **Sandstone Modules.**—Cataraqui Quarries. Township of Pittsburg, County of Frontenac. C. F. Glidersleeve, Kingston. Ontario Government collection.

482 **Sandstone** (*Potsdam*).—Kingston Mills, County of Frontenac. Ontario Government collection.

903 **Sandstone,** (*Double-banded*).—Twelve-inch cube dressed. County of Lanark, near Perth. Perth Town Council. Ontario Government collection.

904 **Sandstone,** (*white*).—*Twelve-inch cube dressed.* Township of Bathurst, near Perth, County of Lanark. Ontario Government collection.

905 **Freestone.** Twelve-inch cube dressed. Orangeville, Township of Caledon, County of Peel. J. C. Goddard, Toronto. Ontario Government collection.

1429 **Sandstone,** (*deep red*).—Six-inch cube. Cataraqui Quarry, Township of Pittsburg, County of Frontenac. Ontario Government collection.

1431 **Sandstone,** (*white*).—Window sill. Bathurst, County of Lanark. Ontario Government collection.

1145 Block of Credit Valley brown freestone (Medina formation), 2 feet, 3 inches by 2 feet, 3 inches, by 2 feet, ten inches. The top is artistically carved in Romanesque style after the manner employed on the new Parliament Buildings.

In the centre of the carved work is a shield bearing the Ontario coat of arms.

This specimen shows the working qualities of the stone from the quarries of Messrs. Carroll & Vick.

Tests as to crushing resistance made at the School of Science, Toronto, place it first among the building stone of this continent. Messrs. Carroll & Vick, 84 Adelaide St., Toronto.

SERPENTINE.

61 **Serpentine, with fine veins of chrysotile.**—Lot 7, Concession 5, Township of Oso, County of Frontenac. Ontario Government collection.

209 **Serpentine.**—Small rough block, one polished face. Duncan Mine, Thunder Bay District. Thomas Woodside, Port Arthur. Ontario Government collection.

344 **Serpentine.**—Township of Bedford, County of Frontenac. W. G. Kidd collection.

871 **Serpentine.**—Lot 13, Concession 9, Township of Marmora, County of Hastings. Ontario Government collection.

1169 **Serpentine vase**—10½ inches high and 9½ inches in diameter at the mouth. Ontario Government collection.

LIMESTONE. (Building.)

130 **Limestone,** dressed, 6 inch cube.—Queenston Quarry. P. A. Johnston, St. David's. Ontario Government collection.

131 **Limestone,** dressed, 6 inch cube.—Thorold Quarry. Union Co-operative Stone Co., Thorold. Ontario Government collection.

135 **Limestone,** dressed, 6 inch cube.—Robert McInnes, Owen Sound. Ontario Government collection.

199 **Limestone,** dressed, 6 inch cube.—Owen Sound, County of Grey. Robert McInnes, Owen Sound. Ontario Government collection.

204 **Limestone,** dressed, 6 inch cube.—Wolfe Island, County of Frontenac. T. J. Kilpatrick, Kingston. Ontario Government collection.

205 **Limestone** (*Hydraulic cement, small rough block*).—John Battle, Thorold. Ontario Government collection.

206 **Limestone** (*Dolomite*), dressed, 12 inch cube.—Guelph. D. Kennedy, Guelph. Ontario Government collection.

208 **Limestone,** paving block.—Queenston. P. A. Johnston, Queenston. Ontario Government collection.

216 **Limestone** (*Dolomite*), dressed, 6 x 9 block—Guelph. D. Kennedy, Guelph. Ontario Government collection.

576 **Limestone,** 12 inch cube, dressed.—Pelee Island Quarry. Geo. Farquhar, Toronto Stone Co., Toronto. Ontario Government collection.

647 **Limestone** (*Magnesian*), dressed.—Elora, County of Wellington. At this point the Grand and Irvine Rivers unite at the base of cliffs from 60 to 80 feet in perpendicular height. Both above and below the point of junction, the waters flow in deep channels, the cliffs at some points being not less than 100 feet high. Town of Elora. Ontario Government collection. See large photographs.

785 **Limestone,** dressed block, 2x1x1 foot.—Beamsville Quarries, County of Lincoln. Gibson, Beamsville. Ontario Government collection.

810 **Limestone,** dressed and polished block, 20x12x7 inches.—Ottawa City, County of Carleton. Ontario Government collection.

817 **Limestone,** cubic foot dressed and polished.—Thorold, County of Welland. Town of Thorold. Ontario Government collection.

1180 **Limestone** (*Magnesian*), black, dressed.—Town of Fergus, County of Wellington. Ontario Government collection.

1181 **Limestone** (cube 9 inches).—White's Quarry, Anderdon, County of Essex.

1428 **Limestone,** six inch dressed cube.—Pelee Island, Essex County. Ontario Government collection.

LIMESTONE. (Marble.)

In every case, except that of Renfrew marbles, the specimens exhibited are from the surface or from only a few feet beneath it.

At Madoc, a little has been done by the way of development, but not enough to test fully the qualities of the deposit. The same may be said of the material from Hungerford, near the Village of Bridgewater.

6 **Red,** slab, 18x27 inches, and small block, 6½x6½x2 inches, polished.—Black Bay, Lake Superior, about forty miles east of Port Arthur. Although capable of taking a fair polish, this material is too argillaceous to be properly classed as marble. Locally, it is known as "Jasper," no doubt on account of its color. Ontario Government collection.

7 **Black and grey,** small block, 5¼x5¾x3 inches, polished.—It occurs plentifully as a horizontal bed about twenty feet thick, interstratified with indurated red marble, and with marble of other colors, 20 miles west of Wolfe River Station on the Canadian Pacific Railway, Thunder Bay District. This is a beautifully variegated marble that might be effectively utilized for mantels and other indoor work. Ontario Government collection.

8 **Light purple,** veined with greenish greys and brown, small slab 6x13x1 inch.—From same locality as No. 7, where it forms a bed about ten feet thick, between beds of what is represented by No. 7. Ontario Government collection.

38 **Nipigon marble,** so called, slab, 21x9½ inches, polished.—Plentiful on line of Canadian Pacific Railway, close to Nipigon Bay, and west of Nipigon Station. Approaching argillite in composition; does not take a high polish, but would be suitable for panels in interiors.

The slab is dressed on the plane of laminations. When the edges of these are shown as in the cubes 140 to 155, the effect is much more pleasing. They are also known as Penessie marbles. Ontario Government collection.

39 **Black**, slab, 12x20 inches, polished.—Cornwall. This material also is of argillaceous composition, but takes a high polish, and is commonly known as black marble. Considerable quantities of it are used by the Canadian Granite Co., Ottawa, for mantles, interior wall bases and small pillars. Ontario Government collection.

44 **Black**, cube, six inches, dressed and polished.—Cornwall. (*See No. 39.*)

45 **Black**, cylinder, 5 inches in diameter, polished.—Cornwall. (*See No. 39.*) Ontario Government collection.

46 **Grey, mottled**, 5 inch cylinder, nine inches high, polished.—Renfrew, County of Renfrew. Canadian Granite Co., Ottawa. Ontario Government collection.

All marbles from Renfrew were prepared by the Canadian Granite Company, Ottawa, which owns and works the quarries there.

47 **Grey, mottled**, slab, 12x20 inches—Renfrew, County of Renfrew. Ontario Government collection.

48 **Grey, mottled**, cube, six inches, polished.—Renfrew, County of Renfrew. Ontario Government collection.

136 **Grey and white, banded**, 6 inch cube, dressed.—Bridgewater, County of Hastings, Lot 3, Concession 5, Township of Elzivir. James E. Harrison, Bridgewater. Ontario Government collection.

137 **Grey, mottled**, cube, 6½ inches, polished. Renfrew, County of Renfrew. Ontario Government collection.

138 **Grey, banded**, block, 6x6x4, polished. J. Smith & Co., Sydenham, County of Frontenac. Ontario Government collection.

140 to 155 Collection of "Marbles" from Nipigon series, Wolf Lake, Thunder Bay District. This handsome collection of polished cubes, varying in size from two to six inches, represents material said to exist in considerable quantities. Though not susceptible to high polish, they are rich in color, the tints varying from a mellow grey, through deeper shades to light pinks, purples, greens and browns. Some are banded, some clouded, and others veined. For mantles, panels, mosaics, and interior work of various kinds, they produce a good effect. In quality they are too argillaceous to be classed as true marbles. Ontario Government collection.

156 "**Penessie marble**," small block, dressed.—Wolf Lake, Thunder Bay District. Ontario Government collection.

207 **Marble, white**, six inches, dressed and polished.—Bridgewater, County of Hastings. James E. Harrison, Bridgewater.

210 **Pale green, clouded**, small block, half dressed and polished on one side. J. Smith & Co., Sydenham. Ontario Government collection.

211 and 212 **Pinkish white**, small half dressed blocks, one side polished. J. Smith & Co., Sydenham. Ontario Government collection.

213 **Grey**, cube, 7 inches, half dressed, one side polished.—Healy's Station. Thunder Bay District. Ontario Government collection.

218 **Green, clouded** (*small, rough specimen.*)—Echo Lake, Thunder Bay District. C. P. Brown, Sault Ste. Marie. Ontario Government collection.

"The samples of marble, shewn by the Hungerford Marble Company, Ltd., Ontario, Canada, were obtained from property situated in the County of Hastings, Province of Ontario, Canada. The nearly black marble, and the greyish black, similar to that obtained near the town of Gouverneur, New York, were obtained from properties in the town of Madoc, near the Grand Trunk Railway, a switch from which extends along side the quarry.

This band of crystalline limestone measures about 900 feet across, the strike runs north and south; it is bounded on the east side by granite, and on the west side by an argillaceous shale, which could be used for rough slating, although it is a little brittle.

The layers of marble are nearly vertical, pitching about ten degrees to the west. The stone is checked a little near the surface; this checking is very much diminished as the quarry is

deepened. The depth now attained is 38 feet below the level, and at that depth the open floors were from six to eight feet apart. The dry seams along the layers are wide, thus enabling long stones to be taken out.

The bands are nearly all of a solid dark color ; those which are streaked with white are variegated in an ornamental manner ; its texture is a medium fine grain, and weathers without any signs of iron rust ; its structure is compact and homogeneous, being practically non-absorbent.

It will burn into a very high grade of lime, of a slightly greyish color. The bluish marble variety is situated about 350 feet from the black variety ; its properties are identical with those of the well-known samples supplied by the different quarries near Gouverneur, New York. This stone is also highly crystalline, practically a pure calcium carbonate, and burns into a very high grade of white lime, suitable for the finest material work.

This stone has not been developed as the black stone has, although cross cutting have been made for over 100 feet ; the layers of stone are very broad, and stones from each layer have been quarried, polished and examined. This stone was covered by a water-tight clay, therefore, has not been exposed at the surface to mechanical violence, and is remarkably free from checks and seams.

The samples of coarse grained white were obtained from the company's property, twelve miles distant from Madoc, situated on the Scootamatta River. Where the River passes through this property, it has a water fall which could be utilized for power, there being a head of over eight feet. There is a good supply of water running through this river at all seasons of the year.

The quarry is considered by experts to be the most advantageously situated quarry for cheap working of any in America. The band of crystalline limestone in which this quarry is situated is some 500 feet wide, and runs north and south. The layers dip slightly eastward, but are almost vertical. The bands are bounded on the east by quartzose rock, in which are masses of quartz and feldspar. Immediately following this is a cross-grained pinkish colored syenite. At the west side is a very highly altered shale, which also dips at a high angle. This shale varies in places from gneissic to a chloritic, talcose and micaceous, succeeded by gneiss. The stone is very nearly pure calcium carbonate. as shown by the report made by Dr. Chapman, Professor of Mineralogy at Toronto University. It has a very high structural strength as is shown by the tests made by the Watertown Arsenal, New York State.

Two layers of salmon colored stone have already shown up, one about ten and the other about eighteen inches in width ; as these have not been developed we can say very little about them.

Some surface stone taken from this quarry was twelve feet long, from which nine foot window sills were cut ; they were perfectly sound in every respect.

Lime burned from this stone cannot be surpassed, being pure white in color, absolutely free from impurities, such as sand and iron oxide. When used for plastering along with clean sharp sand it gives a hard, white close finish, superior to the best plaster paris.

Any quantity of wood can be obtained in this neighborhood for less than $1.25 per cord. The proposed extension of the Napanee and Tamworth Railway will be through this property, giving direct communication with the main line of the G. T. R. and C. P. R.

For further description of these marbles, and the properties from which they are obtained, we beg to refer you to the sworn testimony of Mr. D. J. Whitney, given before the Ontario Mining Commission reported on page 80 of their printed report."

Certificate of analysis of sample of marble from the quarries of the Hungerford Marble Co., North Hastings, Ontario.

"This sample is a pure white saccharoidal limestone, forming a marble of exceedingly good quality. The specific gravity equals 2.751. Absorption 0.30 per cent. Although highly crystalline, the stone, at the same time, is of great strength. Many dolomitic (*i. e.* magnesian) marbles, weather yellowish or brownish, as the magnesia is very constantly associated with ferrous carbonate ; but as the amount of the latter compound in this sample does not exceed a mere trace, there is no risk of the stone changing color on exposure. Its absorbent power is, moreover, very low : hence the marble is well adapted to resist the action of frost and atmospheric disintegration generally. Unlike most of our crystalline limestones, also, the marble is remarkably free from intermixed grains of pyroxene, graphite and other minerals, the presence of which greatly

detracts from the commercial value of ordinary marbles. In a word, the sample submitted to me for examination and analysis represents a marble of very superior quality.

On hundred parts contain :—Calcium carbonate 90.34 ; magnesium carbonate 8.71 ; ferrous carbonate, trace only ; silica 0.93.

EDWARD J. CHAPMAN, Ph. D.

Professor in University College and School of Practical Science, Toronto, and consulting Mining Engineer.

Toronto, February 22nd, 1887.

From 303 to 312 are specimens from Hungerford Marble Co., and are exhibited by P. W. Ellis, Toronto.

303 **Black,** small block 6x6x3½ inches.—Madoc, County of Hastings.

304 **Black,** paper weight, 3½x4x1 inch.—Madoc, County of Hastings.

305 **Black, with white streaks,** paper weight, 3½x3x1 inch.—Madoc, County of Hastings.

306 **Pink,** turned paper weight.—Madoc, County of Hastings.

307 **Grey, dark mottled,** turned paper weight.—Madoc, County of Hastings.

308 **Grey, dark veined,** turned pillar cap, 13 inches high.—Madoc, County of Hastings.

309 **White,** slab for table top, 20x24 inches.

310 **White,** turned pillar 14 inches high.

311 **White,** card receiver.

312 **Black,** pillar 6 feet, 6 inches high.

633 **White,** slab 7x30 inches, reported to possess excellent working qualities.—Township of Marmora, County of Hastings. Crescent Gold Mining Co., Malone. Ontario Government collection.

634 **White,** block 8x7x6 inches (*same as No. 633.*)—Ontario Government collection.

From 791 to 806 inclusive are from the Sanford property, Township of Barrie, County of Frontenac.

791 **Pink of rich tint,** small pillar 13 inches high.—Township of Barrie, County of Frontenac. Ontario Government collection.

792 **Pink,** block 6½x6x5.—Township of Barrie, County of Frontenac. Ontario Government collection.

793 **Pink,** slab 12x8 inches. Ontario Government collection.

794 **White,** slab 13½x14½ inches.—Ontario Government collection.

795 **White,** turned pillar 17 inches high and 5 inches in diameter.—Township of Barrie. Ontario Government collection.

796 **Grey, with brown veins,** pillar 14 inches high and 4 inches diameter. Ontario Government collection.

797 **White,** slab 10½x15½ inches.—Ontario Government collection.

798 **Grey, light clouded,** slab 10½x15½ inches, dressed and polished.—Ontario Government collection.

799 **Pinkish white with dark grey veins,** slab 10x11½ inches, dressed and polished.—Ontario Government collection.

800 **White, with brown veins,** small pillar 14½ inches high, 4¾ inches diameter, dressed and polished.—Ontario Government collection.

801 **White, with Brown veins,** small slab 9x11½x2 inches, dressed and polished.—Ontario Government collection.

802 **White, with Brown veins,** 6 inch cube, dressed and polished.—Ontario Government collection.

803 **White,** 6 inch cube, dressed and polished.—Ontario Government collection.

804 **Grey**, small block 6x6x5 inches, dressed and polished.—Ontario Government collection.

805 **Grey**, small block 5x5x4 inches, dressed and polished.—Ontario Government collection.

806 **Greyish White**, with dark grey veins, dressed and polished.—Ontario Government collection.

807 **Grey, mottled**, small block 5x5½x4½ inches, dressed and polished.—Renfrew, County of Renfrew.—Ontario Government collection.

808 **Grey, mottled**, slab 10x11½ inches, dressed and polished.—Renfrew, County of Renfrew. Ontario Government collection.

809 **Grey mottled**, small pillar 6 inch diameter.—Renfrew, County of Renfrew. Ontario Government collection.

1162 **White block**, 8 x 9 x 9½ inches, dressed and polished.—P. W. Ellis, Toronto.

1163 **White**, 10 inch cube, dressed and polished.—P. W. Ellis, Toronto.

1172 **White column and base**—Lot 2, Concession 4, Township of Elzevir. Analysis by Professor Edwards, gives :—97 per cent. carbonate of lime and 3 per cent. nearly pure white magnesia. For first class plastering work from four to five parts of sand are required to one part of lime. The lime made from this stone sets slowly and is more effective than common lime, and dries with a very hard finish. This marble is of the statuary variety, and is highly crystallized, retaining its color even when exposed to the weather. These are surface specimens ; the quality would no doubt improve at a greater depth. James E. Harrison, Bridgewater. Ontario Government collection.

1173 **Marble, Grey**.—Lot 3, Concession 5, Township of Elzevir. James E. Harrison, Bridgewater. Ontario Government collection.

LITHOGRAPHIC STONE.

255 **Lithographic Stone.**—Township of Marmora, County of Hastings. D. E. K. Stewart, Madoc.

449 **Lithographic Stone.**—Eganville, County of Renfrew. Ontario Government collection.

596 **Lithographic Stone.**—Township of Madoc, County of Hastings. A. A. McDonald, Madoc.

629 **Lithographic Stone.**—Crow Lake, Township of Marmora, County of Hastings. Dr. C. W. Volney.

"I discovered this stone in the summer of 1891, in a sub-stratum of the formation near Marmora ; in physical proportions, grain and evenness, it proves to be excellent material, and the chemical composition, according to my analysis, proves it to be a true "Lithographic Stone." I have quarried a considerable quantity, cutting it on the place by machinery erected in 1892, and it is now in practical use. C. W. Volney, Ch. D., Marmora, Ontario."

On this stone has been drawn, by Alexander & Cable, Toronto, an excellent picture of the new Provincial Legislature Buildings, in Queen's Park, Toronto, and completed during the present year.

1160 **Lithographic Stone**—Township of Harvey, County of Peterborough. H. Grundy, Peterborough. On this stode there is engraved a picture of the new Parliament Buildings.

CLAYS AND MARLS.

Excellent clay for the manufacture of bricks, both red and white, is found abundantly in Ontario, and within the last few years, several extensive beds have been discovered, the material from which is admirably adapted for the manufacture of terra cotta. Beds of this character are worked at Milton, Campbellville, Napanee and near Toronto.

231 **Kaolin** (*White*).—Missinaibi River, Algoma District. E. B. Borron, Toronto. Ontario Government Collection.

232 **Kaolin** *(Red and white).*—Missinaibi River, Algoma District. E. B. Borron, Toronto. Ontario Government collection.

437 **Modelling Clay.**—Lot 33, Concession 12, Township of Sebastopol, County of Renfrew. Lawrence Meaney, Eganville.

582 **Modelling Clay.**—Lot 9, Concession 8, Township of Murray, County of Northumberland. Wm. Free, Frankford.

1193 **Silicate Clay.**—Used in the manufacture of fire-proof wood cement or paint. R. J. Doyle, Owen Sound.

1194 **Soluble Silicate** *(Clay).*—In powder, prepared for the manufacture of paint. R. J. Doyle, Owen Sound.

1195 to 1206 Colors manufactured from Silicate Clay. R. J. Doyle, Owen Sound.

1207 to 1220 Silicate paints applied to wood, tin, iron and zinc. Analysis of the Silicate Clay forming the base of Doyle's Patent Wood Cement, and when mixed with Doyle's Patent Non-inflammable Oil :

Moisture 1.42, silica 62.26, alumina 14.70, ferric oxide 3.22, lime 5.28, magnesia .68, carbon dioxide 10.09, potassium oxide, sodium oxide 2.64. (Signed) Robert C. Hedley, analytical chemist.

1221 **Clay.**—Sarawak. C. Littlebridge, Owen Sound. Ontario Government collection.

1222 **Marl.**—Township of Madoc, County of Hastings. Wm. Feeny, Madoc. Ontario Government collection.

1223 **Clay.**—Missinaibi River. E. B. Borron, Toronto. Ontario Government collection.

1224 **Clay.**—Rockview. Dr. Robertson, Milton. Ontario Government collection.

1227 **Marl.**—Whitney. W. G. Allan & Sons, Marlbank. Ontario Government collection.

1275, 1276 **Clay.**—Mattagami River. Ontario Government collection.

1277 **Clay.**—Missinaibi River. Ontario Government collection.

1282 **Kaolin** *(White)*
1283 **Kaolin** *(Pink)* } Near mouth of Moose River, Emptying into Hudson Bay. Ontario Government collection.

1284 **Marl.**—Lot 1, Concession 9, Township of Madoc, County of Hastings. W. Feeney Madoc.

Analysis : Carbonate of lime 81.00, magnesia 2.10, iron 3.00, sulphate of lime 6.00, phosphate of lime 2.20, organic matter 3.10, insoluble 1.60, Loss 2.00. Ontario Government collection.

1430 **Kaolin.**—Soak Brook, Missinaibi River, Hudson Bay Slope. E. B. Borron, Ontario Government collection.

1432 **Terra Cotta Partition Bricks.**—Bathbun & Co., Deseronto.

1433 **Marl.**—Township of Sebastopol, County of Renfrew. A. Parks, Eganville.

1568 **Marl.**—Lot 10, Concession 1, Township of Uxbridge, County of Ontario, two miles from Stouffville Station. Patrick Handrehen, Stouffville.

STEATITE, SOAPSTONE OR TALC.

Steatite, or talc occurs in foliated, granular and compact or cryptocrystaline forms. When foliated, the folia are generally easily separable. The color is usually a dingy white, greenish white, or light green. In the massive form known as soapstone or steatite, it is grey, greyish green, or brownish green. When *sufficiently* pure and soft, with a pearly lustre, it is known as *Venetian* or *French chalk*. When wax-like, it is called *Rensellærite*, and varies in color from white through yellow, grey and green tints to almost black. In the indurated form, it is slaty, and hard. All these varieties of talc are more or less greasy to the touch, hence the names soapstone and steatite.

It is often associated with serpentine, dolomite and actinolite or bitter spar.

Finely ground, it may be used as a lubricant. It is easily carved, and the finer qualities of it may be made into ornaments. Some kinds of porcelain require a certain amount of talc. In the Rensellærite, or, as some prefer, pyrallolite, it occurs near Brockville, in Leeds County Ramsay in Lanark, Rawdon in Hastings, Clarendon in Frontenac, and elsewhere.

As a cheap paint, soapstone has been found serviceable. Its refractory qualities render it useful for lining furnaces. Portable furnaces and small stoves have been made from it. Subjected to a strong heat it becomes comparatively hard, and takes a good polish. Stained of different colors it has been manufactured by this process into buttons, pen-holders and many other small articles.

In Ontario it was much used by the prehistoric Indians for smoking pipes, and many finely carved specimens have been found.

Gas-burner jets have been made from it, and it has even been employed for cosmetic purposes, as in *Venetian chalk*.

One of the most recent uses to which the finer qualities of this mineral are applied, is the manufacture of paper. From 20 to 25 per cent. of finely ground talc may be incorporated with the wood or other pulp.

62 **Steatite**—Lot 22, Concession 6, Township of North Elmsley, County of Lanark. Ontario Government collection.

129 **Talc** (*Foliated*).—Township of Grimsthorpe, County of Frontenac.
Analysis shows: Silica 60.61, magnesia 30.84. ferrous oxide 2.67, alumina 0.73, water 4.94, waste 21. Robert Flynn, Mountain Grove. Ontario Government collection.

220 **Steatite.**—Thunder Cape, Thunder Bay District. Ontario Government collection.

221 **Steatite,**—Sydenham, County of Frontenac. J. Smith & Co., Sydenham. Ontario Government collection.

222 **Steatite.**—Rainy Lake, Rainy River District. D. F. Burke, Port Arthur. Ontario Government collection.

363 **Talc, foliated.**—Township of Grimsthorpe, County of Frontenac. Ontario Government collection.

364 **Steatite.**—Township of Grimsthorpe, County of Frontenac. W. G. Kidd collection.

365 **Steatite.**—Township of Portland, County of Frontenac. W. G. Kidd collection.

481 **Steatite.**—Marble Lake, Township of Barrie, County of Frontenac. W. G. Kidd collection.

736 **Steatite**—Township of Snider. R. H. Ahn, Mining Broker, Toronto and Sudbury.

754 **Steatite.**—Lots 8, 9 and 10, Concession 5, Township of Grimsthorpe, County of Frontenac. Robert Flynn, Mountain Grove. Ontario Government collection.

1191 **Talc** (*White*).—Township of Miller, County of Frontenac. T. W. H. Leavitt, Alpaugh P. O. Ontario Government collection.

1281 **Ground Talc** (from material represented by No. 129).—Robert Flynn, Mountain Grove. Ontario Government collection.

1345 } **Steatite or Soapstone.**—Pipe Stone Point, Lake-of-the-Woods, Rainy
1479 } River District. Rat Portage collection.

GRAPHITE.

This mineral is commonly known as plumbago and black lead, both of which are misnomers. It occurs in various forms, massive, disseminated, columnar or aciculated, foliated, slaty and earthy, and more rarely in concretionary radiations.

Graphite is pure carbon, and usually has a little oxyd of iron mechanically mixed with it. Lime is also frequently present.

"The plumbago of the Laurentian rocks generally occurs in beds or seams of from a few inches to two or three feet in thickness. These are often interrupted, giving rise to lenticular masses, which are sometimes nearly pure, and at other times mingled with carbonate of lime, pyroxene and other foreign minerals. These deposits of plumbago generally occur in the lime-

stones, or in their immediate vicinity and granular varieties of the rock often contain large crystalline plates of plumbago. At other times this mineral is so finely disseminated as to give a bluish grey color to the limestone, and the distribution of bands thus colored serves to mark the stratification of the rock. Workable deposits of plumbago occur in the Township of Burgess. . . . .

It occurs also in various localities in townships lying to the rear of Kingston, in the County of Frontenac, especially in Loughborough and Bedford. Valuable deposits no doubt exist elsewhere in this district.

The plumbago of the Laurentian series is, however, not confined to the limestones. Large crystalline scales of it are occasionally disseminated in pyroxene rock, in pyrallolite, and sometimes in quartzite, and in feldspatic rocks, or even in magnetic oxyd of iron.

Graphite is used extensively in the arts. The finer qualities are employed for making "lead pencils." When free from gritty or earthy matters, it is used as a lubricant for heavy machinery. Considerable quantities are sold as "black lead" for polishing stoves and grates. Moulders employ it to some extent in their trade. When mixed with a suitable quality of clay small furnaces for assayers are made from it. Perhaps its most important use is for the manufacture of crucibles. Its exceedingly refractory character renders it extremely valuable in withstanding high degrees of heat.

Much of the graphite in Ontario is of a purely crystalline variety, and is correspondingly valuable, containing as it does only a small proportion of earthy matter.

65 to 72 **Graphite.**—Lot 1, Concession 5, Township of Ashby, County of Addington; 100 tons said to be in sight. Ontario Government collection.

73 to 75 **Graphite.**—Lot 22, Concession 6, Township of N. Elmsley, County of Lanark. Ontario Government collection.

76 to 79 **Graphite.**—Lot 21, Concession 6, Township of N. Elmsley, County of Lanark. Thompson & Monaham, Toronto. Ontario Government collection.

223 **Graphite**—Pays Plat River, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

300 **Graphite.**—Township of South Sherbrooke, County of Lanark. John Hart and John Manion, Perth. Ontario Government collection.

349 to 351 **Graphite.**—Township of Bedford, County of Frontenac. Ontario Government collection.

598 **Graphite.**—Haliburton District. Richardson & Co., Kingston.

812 **Graphite.**—Lot 34, Concession 9, Township of Denbigh, County of Frontenac. Analysis shows :—32 per cent. lime. Hon. John T. Wood, Brockville. Ontario Government collection.

946 **Graphite.**—Two small specimens. J. L. Aunger collection.

1489 **Graphite.**—Township of Lake, County of Hastings. Henry Johnson, Coe Hill.

MOLYBDENITE.

224 **Molybdenite.**—Terrace Bay, Lake Superior, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

227 **Molybdenite** (*small sample*).—Rainy River District. D. F. Burke, Port Arthur. Ontario Government collection.

228 **Molybdenite** (*small sample*).—Rainy River, Rainy River District. D. F. Burke, Port Arthur. Ontario Government collection.

229 **Molybdenite.**—Terrace Bay, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

230 **Molybdenite and Bismuth** (*small sample*).—McKenzie River, Thunder Bay District. McKellar Bros., Fort William. Ontario Government collection.

352 **Molybdenite crystal.**—Petawawa, County of Renfrew. W. G. Kidd collection.

353 **Molbdenite.**—Calabogie, County of Renfrew. W. G. Kidd collection.

354 **Molybdenite.**—Mountain Grove, County of Addington. W. G. Kidd collection.

570 **Molybdenite.**—Township of Monteagle, County of Hastings. William Jenkins, Madoc. Ontario Government collection.

767 **Molybdenite.**—Eastern Ontario. Ontario Government collection.

816 **Molybdenite.**—Lot 4, Concession , Township of Miller, County of Frontenac. (Marked on old Free Grant Map as Lot 4, without any Concession.) Ontario Government, collection.

901 **Molybdenite.**—Township of Tudor, County of Hastings. Ontario Government collection.

947 **Molybdenite** (*two small specimens*).—J. L. Aunger collection.

ACTINOLITE.

56 to 60 **Actinolite.**—Lot 36, Concession 4, Township of Clarendon, County of Frontenac. John Armstrong, Plevna. Ontario Government collection.

157 **Actinolite**—(Roughly dressed 6-inch cube, one side smoother,) radiated. James E. Harrison, Bridgewater, County of Hastings. Ontario Government collection.

375 **Actinolite.**—Bridgewater, County of Hastings. Ontario Government collection.

569 **Actinolite.**—Township of Sebastopol, County of Renfrew. Ontario Government collection.

606 **Actinolite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

753 **Actinolite.**—Lots 8, 9, and 10, Concession 5, Township of Grimsthorpe, County of Hastings. Robert Flynn, Mountain Grove. Ontario Government collection.

755 **Actinolite.**—Lots 8, 9, and 10, Concession 5, Township of Grimsthorpe, County of Hastings. Robert Flynn, Mountain Grove.

756 **Actinolite.**—Lots 8, 9 and 10, Concession 5, Township of Grimsthorpe, County of Hastings. Robert Flynn, Mountain Grove.

1174 **Actinoite.**—Polished block (radiated.) Lot 12, Concession 2, Township of Kaladar. The deposits from which these specimens are taken is said to be the most extensive and unbroken yet discovered in America. It lies about ten miles from the Village of Bridgewater, within four miles of the C. P. Railway, in Kaladar Township. It has been satisfactorily tested in the manufacture of paper and for the lining of furnaces; it is easily sawn and dressed; it is also valuable for pigment purposes. James E. Harrison, Bridgewater. Ontario Government collection.

1175 **Actinolite**—Small turned and polished pillar. This actinolite has been satisfactorily tested in Buffalo, as a lining for blast furnaces. When dressed, as in this case, it has an agreeable appearance, and seems to be well adapted for indoor work. It is said to make an excellent fire-proof paint. James E. Harrison, Bridgewater.

ASBESTOS—CHRYSOTILE.

"Tremolite, Actinolite, and other varieties of hornblende or amphibole, excepting those containing much alumina, pass into fibrous varieties, the fibres of which are sometimes very long, fine, flexible, easily separable by the fingers, and look like flax. These kinds, like the corresponding forms of pyroxene are called asbestos. . . . . The name *Amianthus* is now applied usually to the finer and more silky kinds. Much that is so-called is chrpsotile, or fibrous serpentine, it containing 12 to 14 per cent of water." Dana, p. 234.

Popularly, all the fibrous varieties of amphibole and serpentine are regarded as asbestos.

Logan says, "The true asbestos, however, is a fibrous tremolite or hornblende."

Foliated and fibrous forms of serpentine are common in veins in the ophiolites of the Silurian series; and they constitute the varieties which have been described under the names of baltimorite, marmolite, picrolite and chrysotile. The latter occurs in silky flexible fibres, whose direction is transverse to the walls of the vein; and it constitutes much of the so-called asbestos or amianthus of serpentine rocks. Geology of Canada, p. 473 (1863).

223 **Asbestos** (*Amianthus*) **Chrysotile**—Ottawa Valley. Ontario Government collection.

498 **Asbestos** (*Chrysotile*)—Township of Kaladar, County of Addington. Ontario Government collection.

594 **Asbestos** (*Chrysotile*) **in Serpentine**—Terrion Farm, lot 13, Concession 8, Marmora. M. H. Powell, Marmora.

595 **Asbestos** (*Chrysotile*) **in Serpentine**—Terrion Farm, lot 13, Concession 8, Marmora. M. H. Powell.

782 **Asbestos** (*Hornblende*)—**very long fibre**—Algoma District. Thompson & Monahan, Minining Brokers, Toronto.

870 **Asbestos** (*Chrysotile*) **and Serpentine**—Lot 13, Concession 9, Marmora. Ontario Government collection.

1192 **Asbestos** (*Chrysotile*)—Lot 1, Concession 6, Township of Olden, County of Frontenac. Robert Flynn, Mountain Grove, Ontario Government collection.

MICA.

Under this term are included the varieties known as Muscovite, Biotite and Phlogophite In eastern and central Ontario it is of frequent occurrence. The white or colorless varieties are not so plentifully distributed, nor are the crystals found so large as in the amber-colored varieties. In the case of the latter, crystals are occasionally met with, having surfaces measuring from twenty to forty square feet. Large crystals are usually very much contorted, involving considerable waste in cutting up for the market. The refuse may be ground into a fine powder for lubricating purposes, and for use in some kinds of high-class wall paper.

A vast impetus has recently been given to the production of mica, on account of its application in the construction of electric motors.

Crystals of Muscovite seldom exceed twenty inches in diameter, but most of them are very much less. Good mica of all kinds finds a ready sale in Britain, Germany, Canada and the United States, and the demand evinces a steady increase. According to size and quality the price varies from 40 cents to $6 per pound.

Most of the mines worked lie in that portion of the Province drained by tributaries of the Ottawa, south of the Mattawa and Lake Nipigon, and in the Counties of Hastings, Addington and Frontenac on Lake Ontario.

63 **Mica** (*Black*)—Lots 15 and 16, Hastings Road West, Township of Herschell. County of Hastings. W. R. Memberry, St. James' Hotel, Toronto. Ontario Government collection.

64 **Mica** (*Black*)—Lot 6, Concession 4, Township of Burgess, County of Lanark. Lee Brothers, Perth. Ontario Government collection.

299 **Mica** (*Black*)—Lot 17, Concession 6, Township of Oso, County of Frontenac. John Hart and John Manion, Perth. Ontario Government collection.

260 **Mica** (*Dark*)—Sydenham, County of Frontenac. W. G. Kidd collection.

584 **Mica, large thick crystal** (*Muscovite*)—Pike Lake Mine, Sydenham, Township of Loughborough, County of Frontenac. W. A. Allan, Ottawa.

603 **Mica** (*Amber*)—Rough sheet from crystal 26x34 inches. Sydenham Lake Mine. W. G. Kidd collection.

604 **Mica** (*White, cut*)—Township of Miller, County of Frontenac. Charles A. Matheson, Perth. Ontario Government collection.

635 **Mica** (*Deep Green*)—Township of Bagot, County of Renfrew. W. C. Caldwell, M.P.P., Lanark. Ontario Government collection.

636 7 **Mica** (*White*)—Cut 2x3½ and 3x4½. Lots 5, 6 and 7, Concession 6, Township of Effingham, County of Addington. Smith & Lacey, Sydenham. Ontario Government collection.

638-43 **Mica** (*Amber*)—In sheets from the crystals. These vary in size from 12x15 inches up to 28x36 inches. Lot 11, Concession 7, Township of Loughborough, County of Frontenac. For electrical purposes this is rated as high grade material. Crystals from the Sydenham Mica Mines have measured upwards of six feet in diameter and weighed several tons. Smith & Lacey, Sydenham, County of Frontenac.

644 **Mica** (*Amber*)—Rough sheet, 20x28 inches, from Smith & Lacey Mines, Sydenham.

645 **Mica** (*Amber*) **crystal**—This crystal is 12 inches thick, having a diameter of 12 inches at the base, tapering towards the opposite end to a diameter of about 6x9 inches. The specimen weighs 120 pounds. Foxton Mine, Foxton Brothers, Sydenham, County of Frontenac.

646 **Mica** (*Amber*) **crystal**—7x8 inches and 1½ inches thick. This crystal is an irregular hexagon with well defined sides. Foxton Brothers, Sydenham, County of Frontenac.

747 **Mica** (*Amber*) **large crystal, 400 pounds**—Godfrey Mine, Lot 1, Concession 3, Township of Hinchinbrooke, County of Frontenac. Mr. Godfrey, Godfrey P.O.

1346 **Mica** (*White*)—Falcon Island, Lake-of-the-Woods, Rainy River District. Rat Portage collection.

FELDSPAR (Massive).

1434 **Feldspar**—Township of Ashby, County of Addington. Ontario Government collection.

Feldspar.—Lot 8, Concession 9, Township of Leeds, County of Leeds. Wm. Pierce, Seeley's Bay.

815 **Feldspar.**—Lot 11, Concession 4, Clarendon Township, Frontenac County. Ontario Government collection.

QUICKLIME.

An unlimited supply of stone for the manufacture of quicklime exists in many parts of the Province, Many hundreds of exhibits might have been procured.

1225 **Quicklime.**—J. H. Tallmadge, Beamsville. Ontario Government collection.

1226 **Quicklime.**—J. McEwen, Owen Sound. Ontario Government collection.

HYDRAULIC CEMENT AND LIMESTONE.

568 **Hydraulic Cement Limestone.**—Lot 10, Concession 2, Township of Drummond, County of Lanark. Peter McGregor, Perth.

1285 **Hydraulic Cement.**—Napanee Cement Works. Rathbun & Co., Dnseronto. Ontario Government collection. Analysis :—Silica acid, 28.43 ; alumina and iron, 10.50 ; lime, 43.05 ; magnesia, 18.02.

1437 **Limestone used in the manufacture of Hydraulic Cement**—Napanee Cement Works. Rathbun & Co., Deseronto.

The following is analysis and records of tests of Portland Cement manufactured at Napanee mills, Ontario :—

Calcium oxide	61.28
Magnesium oxide	1.72
Silica	22.58
Alumina and oxide of iron	12.35
Sulphuric acid	.71
Moisture and carbon dioxide	1.36
	100.00

Tensile tests per square inch section :—

					lbs.
Star Brand, Portland Cement,	24 hours	in air,	6 days	in water, broke	425
"	"	"	30	"	500
"	"	"	90	"	660
"	"	"	270	"	800
"	"	"	6	"	125
"	"	"	30	"	140
"	"	"	4?3	"	430
"	"	"	450	"	457

E. W. Rathbun, Deseronto.

GYPSUM.

The gypsum beds of Ontario, hitherto worked, lie wholly in the valley of the Grand River, rom Paris in the County of Brant to a point some miles south of Cayuga in the County of Haldimand. The beds are found in the Onondaga formation.

In the neighborhood of Paris the gypsum is grey in color and is used chiefly as a fertilizer. The white variety, found at lower localities in the valley, is suitable for all classes of stucco and ornamental work.

On the north-west side of the Moose River, below its junction with the Missinaibi, there are banks of gypsum extending from ten to twenty feet in height, and extending for a distance of seven miles.

225 **Gypsum** (*Selenite*).—Moose River, Algoma District. Ontario Government collection.

226 **Gypsum, small sample.**—J. H. Johnson Caledonia. Ontario Government collection.

355 **Gypsum** (*Selenite*)—Foxton Mine, Township of Loughborough, County of Frontenac. W. G. Kidd collection.

356 **Gypsum, fibrous.**—Cayuga County of Haldimand. W. G. Kidd collection.

1182 **Gypsum.**—Gypsum Mines, County of Haldimand. Robert Glenny, Gypsum Mines P.O. Ontario Government collection.

1566 **Gypsum.**—Lot 5, Concession 6, Township of Oneida, County of Haldimand. Nicholas Garland, Toronto.

1567 **Gypsum.**—Ground from material similar to 1566. Nicholas Garland, Toronto. Analysis:—Pure plaster, 93 per cent; insoluble matter, 7 per cent. The gypsum on thi property is supposed to exist in immense quantities, and thousands of tons are sold annually for fertilizing purposes. It ranks highest in the markets of the world.

1568 **Alabastine.**—A preparation of gypsum for wall decorative purposes, Alabastine Co., Paris, Brant County.

SALT.

The area in which salt is reported to be found in Ontario lies mainly in the counties bordering, or adjacent to Lake Huron. "In the borings that have been made one or more beds are met with at a depth of about 1,000 feet, and varying in thickness from 20 to 100 feet. The quantity is practically unlimited, and the quality is excellent" The chief borings are at Kincardine, Wingham, Blyth, Brussels, Clinton, Seaforth, Mitchell, Goderich, Port Franks, Bothwell, Parkhill, Courtwright and Comber. Late in 1892 salt was discovered at Windsor.

1165 **Salt brine.**—Elarton Salt Well, Lot 2, Concession 3, Township of Warwick, County of Lambton. Elarton Salt Works Co., Warwick.

1166 **Salt (coarse).**—Elarton Salt Works Co., Warwick.

1167 **Salt (fine).**—Elarton Salt Works Co., Warwick.

Memo. of the strata passed through in sinking the Elarton salt well on Lot 6, Concession 3, Warwick, County of Lambton:—

14	feet,	blue clay.
50	"	bituminous shale.
14	"	blue shale,
57	"	fossil limestone.
10	"	blue shale.
10	"	fossil limestone.
14	"	blue shale.
1	"	fossil limestone.
96	"	blue shale.
4	"	fossil limestone.
12	"	blue shale.
20	"	fossil limestone.
38	"	blue shale.

3	feet	iron pyrites.
7	"	blue shale.
117½	"	limestone.
1½	"	soft white stone.
14	"	limestone.
⅓	"	cavity.
16½	"	limestone.
100	"	grey limestone.
10	"	gypsum.
200	"	grey limestone.
100	"	slate.
190	"	grey limestone.
100	"	blue shale.
24	"	salt.
15	"	very hard limestone.
30	"	salt.
61	"	salt, with occasional beds of shale.
67¼	"	hard limestone.

1397 feet—Depth of well
At 960 feet a cavity of six inches filled with water.

Brine as analyzed by Professor H. H. Croft :—

Chloride of sodium	97.622
Sulphate of lime	1.270
Chloride of calcium	0.108
Water	1.000
	100.000

1251 **Salt (fine).**—Elarton Salt Works, Warwick, County of Lambton.

1252 **Salt(dairy).**—Elarton Salt Works.

1253 **Salt (dairy).**—G. McEwen, Hensall.

1254 **Salt (fine).**—G. McEwen, Hensall. Ontario Government collection.

1255 **Salt (coarse).**—Grey, Young & Sparling, Seaforth. Ontario Government collection.

1256 **Salt (dairy).**—Grey, Young & Sparling, Seaforth. Ontario Government collection.

1257 **Salt (fine).**—Grey, Young & Sparling, Seaforth. Ontario Government collection.

1258, 1259 **Salt.**—Wingham. Grey, Young & Sparling, Seaforth. Ontario Government collection.

1260, 1261 **Salt.**—Exeter Salt Co., Exeter. Ontario Government collection.

1262 **Salt (fine).**—Joseph Kidd, Goderich. Ontario Government collection.

1263 **Salt (coarse).**—Joseph Kidd, Goderich. Ontario Government collection.

1264 **Salt (medium).**—Joseph Kidd, Goderich. Ontario Government collection.

1265 **Salt (dairy).**—Joseph Kidd, Goderich. Ontario Government collection.

1266 **Salt (fine).**—F. C. Rogers, Brussels. Ontario Government collection.

1267 **Salt (dairy).**—J. J. Coleman, Seaforth. Ontario Government collection.

1268 **Salt (medium).**—J. J. Coleman, Seaforth. Ontario Government collection.

1269 **Salt (fine).**—J. J. Coleman, Seaforth. Ontario Government collection.

1270 **Salt (coarse).**—J. J. Coleman, Seaforth. Ontario Government collection.

1271 **Salt (fine).**—Joseph Williams, Goderich. Ontario Government collection.

1272 **Salt (dairy).**—Joseph Williams, Goderich. Ontario Government collection.

1273 **Salt (course).**—Ogilvie & Hutchinson, Goderich. Ontario Government collection.

BARITE.

"Heavy spar or sulphate of barite is found in many localities in Canada. In the Laurentian series several veins of this mineral have been observed. One of these, on the second lot of the eighth concession of Lansdowne, intersects the crystalline limestone, and is in some parts mixed with calcite and galena. In other parts the whole vein consists of nearly pure heavy-spar, forming large tabular crystalline masses, which are semi-transparent, and bluish or rarely reddish in color. Well defined crystals are met with in the vein. The Township of Dummer is also cited as a locality by Prof. Chapman.

"On the fourth lot of the sixth range of Bathurst, a vein of opaque white lamellar heavy-spar, said to be about a foot wide, is found in gneiss. It contains small grains of copper pyrites.

"Heavy spar is also met with in McNab, at the mouth of the Dochart, and a red variety is associated with fluor-spar in cavities in the Laurentian limestone, near the hematite of Iron Island, Lake Nipissing. Sulphate of baryta is abundant in many of the veins on the north shore of Lake Superior, and sometimes makes up a great proportion of the vein." *

It is found most abundantly on the north shore of Lake Superior, from Port Arthur southwestwards to the International boundary. A large vein traverses McKellar Island, south of Pie Island, near the entrance to Thunder Bay.

Heavy-spar may be used independently as paint, but is most frequently employed to adulterate other coloring materials, especially white lead.

A pigment known as *permanent white* is obtained from heavy spar by precipitation, and is much finer than that prepared by the grinding process. In this form it is largely employed to give a hard, glossy surface to fine wall-papers.

Quite recently it is said to be employed in the production of illuminating gas from water.

252 **Barite, Purple** (*small specimen*).—North Shore, Lake Superior. Ontario Government collection.

253 **Barite, White Crystalline** (*small specimens*).—McKellar Island, Fort William. Ontario Government collection.

280 **Barite.**—McKellar Island, Thunder Bay District. The vein is from 30 to 70 feet wide, and embraces three lodes of the mineral, each from one to twelve feet wide. McKellar Bros., Fort William. Ontario Government collection.

479 **Barite**—Lake Openicon, Township of Storrington, County of Frontenac. W. G. Kidd collection.

760 **Barite**, two pieces weighing 900 pounds.—Lot 2, Concession 2, Township of Hinchinbrooke, County of Frontenac. Ontario Government collection.

848 **Barite**—McKellar Island, Lake Superior, Thunder Bay District. Wiley & Co., Port Arthur.

CELESTITE.

480 **Celestite.**—Barrifield Common, Kingston. W. G. Kidd collection.

819 **Strontia**, (*Sulphate of*) or Celestite,—Lot 6, Concession 10, Township of Bagot County of Renfrew. "Vein from ten to twelve feet wide on the surface. Three miles from K. & P. Railway." Robert McGregor, Calabogie.

945 **Celestite**—J. L. Aunger collection.

PYRITES.

522-3 **Iron Pyrites** (*massive*), used in the manufacture of sulphuric acid. Standard Fertilizer and Chemical Co., Smith's Falls.

1278 **Iron Pyrites** (*massive*).—The deposit of this material is extensive. The percentage of sulphur is about 44. W. H. Wylie, Marmora.

*Geology of Canada, 1863, page 458.

MINERAL PAINTS.

1230-1243 **Mineral Paints.**—Limehouse County. Ontario Government, collection.

1558 **Mineral Paints.**—"Patent Fire-proof cement." R. J. Doyle, Owen Sound.

APATITE (PHOSPHATE OF LIME).

This mineral occurs in rocks of various kinds and ages, but is most common in metamorphic crystalline rocks, especially in granular limestone, granite and many metalliferous veins, particularly in gneiss, syenite, hornblendic gneiss, mica schist, and beds of iron ore; occasionally in serpentine, and in igneous or volcanic rocks; sometimes in ordinary stratified limestone, beds of sandstone or shale of the Silurian, Carboniferous, Jurassic, Cretaceous or Tertiary formations. It is of frequent occurrence in the upper portion of the Lower Laurentian rocks of Eastern Ontario. It is found in bulbous veins from a few inches to sixteen feet in thickness. Masses weighing from half a ton to five or six tons have been disengaged at a single blast.

Sometimes it is associated with large crystals of phlogopute, and nearly always with pyroxene or hornblende rock. Iron, too, occurs in many mines.

Apatite in its crystalline form is "a thing of beauty." Prisms of all sizes have been found, from an inch to more than a foot in length, and from one-fourth of an inch to a foot in diameter.

Localities. South Burgess, North Elmsley, Bedford, Loughborough, Bathurst, Sebastopol, Storrington, and many other points in the Counties of Leeds, Frontenac, Addington, Lanark and Renfrew.

Extensive deposits in many of these townships are yet undeveloped.

By analysis the apatite of Ontario yields from 70 to 91 per cent. phosphate of lime, ranking among the highest in the world in this important respect.

It forms the basis of the fertilizer known as superphosphate of lime, of which large quantities are produced by the Standard Fertliizer and Chemical Co., Smith's Falls, Ontario.

In color it varies from a greyish white, through red, brown, green, purple and blue to nearly black.

As "sugar phosphate" it is roughly granular, and light in color. In this form it attains the highest point of purity.

Most of the apatite produced in Ontario finds a ready market in Europe, chiefly in Germany and Britain. The lowest grade exported averages at least 70 per cent. tribasic phosphate of lime; the highest seldom averages more than 85 per cent. When the demand is good, apatite is worth from 11d. to 12d. per unit, or per cent.; thus 75 per cent. phosphate at 11d. would be worth $16.50 per ton, and 85 per cent. would bring $20.40, reckoning the British shilling at 24 cents. In 1890 these prices were exceeded when apatite (free on board) in Montreal brought the following:—70 to 75 per cent., $14.37 per ton; 75 to 80 per cent., $17.82; 80 to 85 per cent., $22.41, and 85 per cent., $24.70.

26 **Apatite.**—Lot 3, Concession 8, Township of North Burgess, County of Lanark. Ontario Government collection.

27 **Apatite.**—Lot 2, Concession 5, Township of Oso, County of Frontenac. Analysis by Mr. Brodie, Smith's Falls, shows 81 per cent. phosphate of lime. Deposit said to be large in a locality little known. Ontario Government collection.

28 **Apatite.**—Lots 20 and 21, Concession 15, Township of Storrington, County of Frontenac. Analysis by J. J. McDonald, Professor of Chemistry, Bishop's College, gives phosphoric acid 36.39 per cent., equivalent to tribasic phosphate of lime 82.35 per cent. Ontario Government collection.

29-32 **Crystals of Apatite.**—Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. Alexander Parks, Eganville.

36 **Apatite.**—Lot 9, Concession 7, Township of North Burgess, County of Lanark. Ontario Government collection.

From 313 to 366 form part of the W. G. Kidd collection.

313 **Crystal** (*dark green*).—Township of Bedford, County of Frontenac.

314 **Crystal** (*dark green*).—Township of Sebastopol, County of Renfrew.

315 **Crystal** (*brown*).—Lake Clear, County of Renfrew.

316 **Crystal**, with both terminations.—Buck Lake, Township of Bedford, County of Frontenac.

317 **Crystals** (*cluster*).—Township of Burgess, County of Lanark.

318 **Crystals** (*compound*).—Township of Bedford, County of Frontenac.

319 **Crystal** (*termination*).—Township of Bedford, County of Frontenac.

320 **Crystal** (*termination*).—Bob's Lake, Township of Bedford, County of Frontenac.

321-2 **Crystals**.—Township of Sebastopol.

323 **Crystal**.—Westport, County of Leeds,

324 **Crystals** (*small cluster*).—Westport, County of Leeds.

366 **Crystal**.—Parham Mine, County of Frontenac.

412-427 **Crystals in Calcite**.—Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. These beautiful crystals are of various sizes and colors. They are embedded in calcite of a warm pink tint, and are probably among the finest to be found anywhere. On the lot on which the crystals are found they occur near the surface. No mining has been done, and it is probable that massive phosphate of lime exists in enormous quantities, as the outcrops are numerous. Ontario Government collection.

428-435 **Phosphatiferous Calcite**.—Turner's Island, Lake Clear, Township of Sebastopol, County of Renfrew. These specimens consist mainly of a deep red calcite interspersed with green phosphate. Considerable quantities of apatite of high grade have been taken from the mine on Turner's Island, but the distance from a railway left only a small margin of profit. The line of railway now being built from Ottawa to Parry Sound will pass near the phosphate district in Sebastopol and adjoining townships. Ontario Government collection.

From 465 to 500 form part of the W. C. Kidd collection

465 **Crystal** (*brown*).—Eel Lake, Township of Loughborough, County of Frontenac.

466 **Crystal** (*green*).—Township of Bedford, County of Frontanac.

469 **Crystal**.—Bob's Lake, Township of Bedford.

470 **Fragmentary Crystal** (*green and purple*).—Parham Mine, County of Frontenac.

471 **Crystal** (*dark red*).—McKierman's Mine, near Eganville, County of Renfrew.

475 **Crystal** (*greenish brown*).—Eagle Lake, Township of Hinchinbrooke, County of Frontenac.

475 **Crystal**.—Lake Clear, Township of Sebastopol, County of Renfrew.

476 **Crystal**.—Eagle Lake, Township of Hinchinbrooke, County of Frontenac.

488 **Apatite, Mica and Calcite**.—Sydenham Lake, Township of Loughborough, County of Frontenac.

495 **Crystal** (*purple and green*).—Parkham Mine, County of Frontenac.

500 **Crystals** (*six small, perfect specimens of various colors*).

1591 **Marl**.—Lot 15, Concess on 6, Township of Somerville, County of Victoria. About 7 acres, average depth 8 feet. Within ½ mile of railway. Henry Glendinning, Manilla.

From 501 to 554 form an excellent exhibit of the crude material, agents and products connected with the work of the Standard Fertilizer and Chemical Co. of Smith's Falls, R. J. Brodie, president. This is the only Company in Ontario engaged in the manufacture of fertilizers from apatite or phosphate of lime.

501 to 520 **Apatite**, from Otter and other Mines.—Township of Burgess, County of Lanark, and from various other mines. The samples represent the crude material employed in the manufacture of superphosphate and other fertilizers, by the Standard Fertilizer and Chemical Co., Smith's Falls.

521 **Apatite in calcite.**

524 **Granulated Apatite.**

525 **Ground Apatite.**

526 **Floated Apatite.**

527 **Superphosphate.**

528 Double Superphosphate.
529 No. 1 Fertilizer.
530 Special Fertilizer.
531 Standard Fertilizer.
532 Fruit tree Fertilizer.
533 Peach yellows Remedy.
534 Acid Phosphate (*liquid*).
535 Acid phosphate (*dry*), fine.
536 Acid phosphate (*dry*), medium.
537 Acid phosphate (*semi-crystalline*),
538 Bone Char, superphosphate.
539 Bone meal.
540 Granulated bone.
541 Sulphuric acid.
542 Phosphoric acid.
543 Phosphate of soda.
544 Phosphate of soda.
545 Sulphur.
546 Sulphate of lime
547 Sulphate of soda.
548 Sulphate of ammonia.
549 Sulphate of Potash.
550 Muriate of Potash.
551 Nitrate of Potash.
552 Nitrate of Potash.
553 Sylvinite.
554 Kainite.

597 **Apatite Crystal.**—West half of Lot 13, Concession 7, Township of Loughborough, County of Frontenac. Richardson, Kingston.

605 **Apatite Cyrstal in Calcite.**—A very beautiful and perfect specimen ; Lot 32, Concession 12, Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

610 **Apatite Crystal, end** (*abnormal form, apparently more than six sides*).—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

618 **Apatite Crystal in Calcite.**—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

624 **Apatite**, red and green, in orange calcite.—Township of Sebastopol, County of Renfrew. W. G. Kidd collection.

898 **Apatite** (*phosphate of lime*) —Lot 15, Concession 11, Township of Monmouth Haliburton District. Haliburton Mining Co., Toronto.

899 **Apatite** (*phosphate of lime*).—Lot 15, oncession 11, Township of Monmouth, Haliburton District. Haliburton Mining Co., Toronto.

983 to 999 **Apatite.**—Phosphate of lime, small specimens of various colors and quality, from different locations in Eastern Ontario.

1000 **Apatite with Pyrite.**

1001 to 1017.—**Apatite Crystals** of various sizes and colors.

1018 **Apatite Crystals in Calcite.**

1019 **Apatite in Red Calcite.**

1171 **Apatite,** large mass weighing nearly half ton.—Foxton Mine, Lot 13, Concession 10, Township of Loughborough. This is said to be one of the largest pieces of Apatite taken from any mine in Ontario. Foxton Bros., Sydenham.

PETROLEUM.

Ontario is the only rock oil-producing Province in the Dominion. The chief centres of this industry are in the County of Lambton at the towns of Petrolia and Oil Springs. In the Petrolia district alone there are fully 2,500 wells in operation. The refined oil for illuminating purposes is of high quality, and is consumed almost entirely in Canada. In addition to the illuminating oil, the products are naphtha, gasoline, lubricating and wool oils, vaseline, paraffine wax and coke.

Petroleum occurs also at Comber in Essex, Bothwell in Kent, Humberstone in Welland, and near Little Current in Manitoulin Island.

At Petrolia, oil is reached at from 465 to 475 feet in depth. The rock in which it is stated to exist is a "porous dolomitic limestone, from one or two to five or six feet thick, brown in color, probably from the petroleum, and very soft."

"Petrolia and Oil Springs' drillers are very expert, and are called for all over the world, much work being done by them in Europe, Asia and Australia."

The discovery of petroleum in Canada and the United States, about forty years ago, marked a new era in the history of the world and the developments of its various branches, has added to the store of commodities for man's needs and comforts, in a wonderful manner. The rise and progress of this industry furnishes a chapter of history replete with interest at every stage and evinces in a striking degree, the possible outcome of labor and research in developing resources which have been held in reserve beneath the earth's surface and the production of which in all probability still goes on in nature's vast laboratory.

The oil production of Canada during the period named, has been confined to western portions of Ontario and particularly to the County of Lambton. The oil is found at an average depth of 480 feet, in a bed of porous limestone rock, commonly termed "oil rock." With the improved machinery now in use, wells are drilled very rapidly, a number of these wells are pumped by one engine and many ingenious contrivances are used to connect the scattered wells with the pumping power.

The crude oil is conveyed by pipe line from the various outlying districts, to the refineries where it is stored in underground tanks so as to be available for refining purposes.

Petrolia, situated in the centre of the oil region, has long been recognized as the best location for refining oil, and a number of firms and corporations are actively engaged in carrying on business there in these different branches. Foremost among them is the Imperial Oil Company, (Limited), from whose works comes the exhibit of Petroleum products, shown in the Ontario Department of the World's Fair, and a few words as to the history and progress of this Company, are in order.

The Imperial Oil Company, (Limited), occupies a leading position among Petroleum refiners of Canada, having at its inception consolidated the interests of a number of well-known firms, so that its establishment practically dates back to 1859 (though not incorporated until 1880) and covers almost the entire working period of Canada's oil industry. Their works extend over an area of sixty-five acres. In connection with these a pumping station is established and pipe lines run to the various points of oil-producing territory.

Illuminating Oil.—In this direction they have a very large capacity and special processes secured under patents, together with skilled labor and careful attention to manufacturing details have enabled them to produce burning oils which are recognized as standards of excellence in all grades. Their leading brands are "Imperial" and "Silver Star" in Prime White and in Water White, "Crescent," "Headlight" and "Oleophene."

Cooperage and Tin Can Factory.—To supply the packages requisite for placing these oils on the market, a well equipped steam co-operage and stave mill is worked, having a capacity of 100,000 bbls. per annum. The material comes from the forest in logs and the rest of the work is done in the factory, with the aid of the latest improved machinery, some of which is simply marvellous in its operation.

For the more distant Canadian markets, tin cans and cases are required and here the Company's extensive oil can plant (the only one in Canada) finds scope, the capacity being 50,000 cans per month.

Paraffine and lubricating department. Canadian petroleum has long been recognized as very rich in lubricating and paraffine properties, hence the energies of the Company have been directed to these branches, with the most gratifying results. Even a short description of the products would occupy too much space and the names of the leading lines, as given below, must suffice, viz :—

Cylinder oils, all grades. Engine oils, light and heavy. Spindle oils, light and heavy. Dynamo oils. Car axle oil. Tanners' finishing and stuffing oils. Wool oil. Harness and coach oils. Axle grease, etc. Paraffine wax of all grades. Paraffine candles.

The Company makes a specialty of lubricating and illuminating oils for railroads and steamboats and at present are supplying the leading lines of Canada.

They have supplied the lighthouses of the Dominion for a number of years.

Distributing branches are established at London, Stratford, Toronto, Kingston, Montreal, Quebec, St. John, Halifax, Winnipeg and Vancouver.

Correspondence is solicited, and visitors to their works, at any time, will receive courteous attention.

An examination of the samples displayed will interest the general sight-seer, but more especially, manufacturers, and it is difficult to name any industry in our busy world that does not, in some form or other, consume its quota of oil

The officers of the company are :—F. A. Fitzgerald, president ; J. L. Englehart, vice-president ; William Pratt, secretary, Petrolia, Canada."

IMPERIAL OIL COMPANY (LIMITED).—Petrolia, Ontario, Canada. Exhibit of petroleum oils and the products of petroleum,

1356 Imperial Cylinder Oil.
1357 Marine Cylinder Oil.
1358 Locomotive Cylinder Oil.
1359 Steamed Refined Cylinder Oil.
1360 Filtered Cylinder Oil.
1361 Marine Engine Oil.
1362 Imperial Engine Oil.
1363 Thrashing Engine Oil.
1364 Light Engine Oil.
1365 Heavy Engine Oil.
1366 Electric Machinery Oil.
1367 Imperial Machinery Oil.
1368 Extra Heavy Machinery Oil.
1369 Agricultural Machinery Oil.
1370 Shafting Machinery Oil.
1371 Roller Machinery Oil.
1372 Sewing Machinery Oil.
1373 Dynamo Machinery Oil.
1374 Cordage Oil.
1375 Gas Engine Oil.
1376 Bolt and Screw Nutting Oil.
1377 Zero Cold Test Black Oil.
1378 10 Degrees below Zero Cold Test Black Oil.
1379 Paraffine Oil, 25 degrees gravity.

1380 Paraffine Oil, 27 degrees gravity.
1381 Paraffine Oil, 30 degrees gravity.
1382 Sole Leather Oil.
1383 Spindle Oil, Light.
1384 Spindle Oil, Heavy.
1385 Wool Oil, Surprise.
1386 Wool Oil, Magic.
1387 Harness Makers' Oil.
1388 Coach Makers' Oil.
1389 Car Axle Oil.
1390 Passenger Car Oil.
1391 Tanners' Oil.
1392 Fuel Oil.
1393 Water White Burning Oil.
1394 300 Fire Test Railway Oil.
1395 Benzine, Naphtha.
1396 Petrolia Crude Oil.
1397 Oil Springs Crude Oil.
1398 Sarnia Township Crude.
1399 Moore Township Crude.
1400 Solidified Oil, Light.
1401 Solidified Oil, Light.
1402 Axle Grease, Light.
1403 Axle Grease, Dark.
1404 Coal Mine Grease.
1405 Hoof Ointment.
1406 Chain and Dredge Grease.
1407 Paraffine Candle Wax.
1408 Semi-refined Paraffine Wax.
1409 Flake Paraffine Wax.
1410 Soap Maker's Paraffine Stock.
1411 Confectioners' Paraffine Wax.
1412 Miners' Candles.
1413 Paraffine Wax Candles, 6's.
1414 Paraffine Wax Candles, 12's.
1415 Paraffine Wax Cakes.
1416 Paraffine Wax Moulds.
1417 Coke Paraffine.
1418 Paraffine Asphaltum.
1419 Residuum.
1420 Gas Oil.
1421 Special—Paraffine wax bust of Sir John A. Macdonald, modelled by Hamilton McCarthy, C. S. A., Toronto.
1569 Paraffine wax pyramid, 2½ feet high.

LIGNITE.

Lignite is supposed to exist in considerable quantities on the northern slope of the Province. On the rivers Mattagami and Missinaibi, beds of lignite have been observed, but as no boring has been made, it is impossible to say how thick these are. The mineral is found in various stages of carbonization. The samples exhibited were shipped to Toronto, *via* London, from Moose Factory by Mr. E. B. Barron.

1279 **Lignite**.—Big Rapids, Missinaibi Branch of Moose River, about half way between Moose Factory and the Long Portage. Ontario Government collection.

1280 **Lignite**.—Coal Brook, a tributary of the Missinaibi, on the south side, about 12 miles below Long Portage. Ontario Government collection.

NATURAL GAS.

Borings for natural gas in Ontario have been fairly successful. A good supply was struck in Lincoln County, within a few miles of the Lake Erie shore. Other successful borings have been made in the County of Essex, and near Toronto a boring, reached the gas level, but the supply is not large.

OIL SHALE.

769 **Utica Shale** (oil-bearing).—Lot 26, Concession 5, Collingwood, County of Grey. Thomas Fields, Camperdown.

"This richly fossiliferous, oil-bearing shale exists in immense quantities. Previous to the development of the petroleum industry, a company was engaged in the extraction of oil from this shale. Recently an attempt was made to reach oil by boring to a depth of 587 feet when the work ceased. Gas was struck, and it is said there has been a flow of it from the boring for the last four years. The drill penetrated forty feet of shale. The Grand Trunk Railway passes through the property."

MINERAL WATER

At London, St. Catharines, Ancaster, Preston, Arnprior, and elsewhere, are valuable springs of mineral water. At the Caledonia Springs a fine hotel has been erected, and the place is a favorite summer resort for invalids.

1247 **Mineral Water, Natural Seltzer**.—Caledonia Springs. K. Arnoldi, Ottawa. Ontario Government collection.

1248 **Mineral Water, Aerated Gas**.—Caledonia Springs. K. Arnoldi, Ottawa. Ontario Government collection.

1249 **Mineral Water, Saline**.—Caledonia Springs. K. Arnoldi, Ottawa. Ontario Government collection.

1250 **Mineral Water, Natural Seltzer**.—One dozen small bottles. K. Arnoldi, Ottawa.

ARSENIC.

This mineral is usually associated with gold, silver, nickel, iron or bismuth.

The chief source of supply in Ontario was Deloro, in Marmora, Hastings County, where it was a by-product from the auriferous mispickel.

Arsenic is derived as a by-product from the auriferous mispickel of Marmora. At the works now being erected in Marmora Village for the treatment of such ore, arsenic will, no doubt, be produced in considerable quantities.

1228 **Arsenic** (*crude*).—Deloro Mine, Marmora. Ontario Government collection.

1229 **Arsenic** (*refined*).—Deloro Mine, Marmora. Ontario Government collection.

MISCELLANEOUS.

And too late for classification.

376 **Boring from Diamond Drill**—Robertsville Mine, Township of Palmerston, County of Frontenac. W. G. Kidd collection.

758, 759 **Breccia**—Lots 8, 9 and 10, Concession 5, Township of Grimsthorpe, County of Hastings. Robert Flynn, Mountain Grove.

790 **Garnetiferous Gneiss**—Township of Sebastopol, County of Renfrew. Ontario Government collection.

1092, 1093 **Augite Crystals.**—J. L. Aunger collection.

1094, 1095 **Scapolite.**—J. L. Aunger collection.

1096, 1097 **Cores from Diamond Drill Borings.**—J. L. Aunger collection.

1099 **Chrysotile and Serpentine.**

1334 **Polished Agate.**—S. G. Fogg, Rat Portage.

THUNDER BAY COLLECTION.

1493 **Marble.**—Black Sturgeon River, Thunder Bay District. Port Arthur collection.

1494 **Pottery Clay**—Savanne, Nipigon.

1495 **Brick Clay.**—Lyons and Nipigon Townships, Wabigon.

1496 **Fire Clay.**—On Canadian Pacific Railway, near Ox Drift Station.

1497 **Lignite**—Rainy River.

1498 **Peat.**—Peat is found in many parts of the District of Thunder Bay.

1499 **Zinc Blende**—Near Ross Port on Canadian Pacific Railway.

1500 **Flagging.**—Thunder Cape and Sawyer's Bay.

1501 **Pyrite.**—Kaministiquia and Schreiber.

1502 **Limestone,** near Kakabeka Falls.

1503 **Marl,** Dawson Road, 12 miles west of Pahanthen.

1504 **Alum Shales**—Thunder Bay Shores.

1505 **Emery Sand,** near Tache on Canadian Pacific Railway.

1506 **Barite.**—McKellar and Verte Islands.

1507 **Calcite Crystals,** various colors.—Beaver Mine.

1508 **Amethysts.**—Thunder Bay.

1509 **Roofing Slates.**—Jarvis Island.

1510 **Cinnabar.**—Silver Hill, North McIntyre Townshi

1511 **Graphite.**—Thunder Bay Silver District.

1512 **Steatite, or Mountain Tallow.**—Beaver Mine.

1513 **Argentiferous Galena.**—Silver Mountain, East Mine.

1514 **Argentiferous Blende.**—Thunder Bay Silver District.

1515 **Fluor Spar.**—Thunder Bay Silver District.

1516 **Yellow Ochre.**—Kaministiquia.

1517 **Red Ochre.**—Kaministiquia.

1518 **Iron Oxides** (*various*). Thunder Bay.

1519 **Asbestos**—Nipigon, and in unsurveyed territory.

1520 **Silver** (*arsenical*).—Prophyry Point.
1521 **Antimony.**—Woodside Island and McGregor Township.
1522 **Copper** (*native*)—Mamainse Point, Township of Crooks.
1523 **Copper** (*sulphurets*).—Moss and Tache Townships.
1524 **Garnets.**—Rainy Lake.
1525 **Gold.**—Moss Township.
1526 **Gold.**—Brule.
1527 **Gold.**—Wabigon.
1528 **Gold.**—Atik-Okan.
1529 **Gold.**—Moose River.
1530 **Iron** (*Magnetite*).—Atik-Okan.
1531 **Iron**(*Magnetite*).—Mattawan.
1532 **Iron** (*Magnetite*)—Gun Flint Lake.
1533 **Iron** (*Magnetite*).—Current River.
1534 **Iron** (*Magnetite*).—McGregor Township.
1535 **Nickel.**—Gun Flint Lake.
1536 **Nickel.**—Schreiber.
1537 **Nickel.**—Savanne.
1538 **Nickelite.**—3 A Mine.
1539 **Galena** —Munger Mine, Black Bay.
1540 **Galena** —Ogema Mine, Black Bay.
1541 **Jasper.**—White Fish Lake.
1542 **Jasper Conglomerate** —White-fish Lake.
1543 **Manganese** —Sand Lake, on Port Arthur and Duluth Railway.
1544 **Mica.**—Dog Lake.
1545 **Mica.**—Nipigon Lake.
1546 **Mica** —Moose River.
1547 **Serpentine.**—Mattawan.
1548 **Serpentine.**—Nipigon.
1549 **Serpentine.**—Oliver.
1550 **Sandstone** (*red*).—Nipigon.
1551 **Sandstone** (*red*).—Black Bay.
1552 **Sandstone** (*white*).—Thunder Bay.
1553 **Silver** —Beaver Mine.
1554 **Silver.**—Badger Mine.
1555 **Silver.**—Rabbit Mine.
1556 **Silver** —Lily of the Valley Mine.
1557 **Thomsonite** —Gravel Bay.

MAPS.

Ontario —12 by 18 feet, colored geologically, and marked to show the chief mineral deposits.

Nickel Lands in Nipissing and Algoma Districts.—5 by 8 feet, showing properties worked and for sale. This map was prepared by Mr. R. H. Ahn, Toronto.

Parts of Nipissing and Algoma.

North part of Nipissing.

North side of Lake Huron.

Silver Mountain Mining District.

Part of Rainy River District.

Lake of the Woods.

Thunder Bay and the mining region of Lake Superior.

Geological Map of Canada.

Marmora and Madoc.

County of Lanark.

PHOTOGRAPHS.

648 Photograph of view looking down the Grand River, near Elora.

649 Photograph of view looking up the river (*below 648*) and towards Elora.

These pictures give a good idea of the Guelph formation, as it occurs here. The rocks are highly fossiliferous. They yield an excellent quality of quicklime. Springs are numerous at the base of the cliffs, and several caves lend a charm to the general grandeur of the scenery.

1435 Photograph of Fergus, Ontario.

1569 Evans' Mine, surface opening.

Evans' Mine, opening from first level to surface.

1570 Evans' Mine, first level.

1571 Laboratory.

1572 Copper Cliff Mine and Shaft House.

1573 Copper Cliff Mine, looking east.

1574 Copper Cliff Mine, looking west.

1575 Copper Cliff Mine.

1576 Blast Furnaces.

1577 Blast Furnaces, shewing view of Matte and Slag.

1588 Road Yard, capacity, 60,000 tons of ore.

1589 Bessermerizing or Blowing Furnaces.

1590 Matte Yard—6,000 tons of Nickel Matte in stock.